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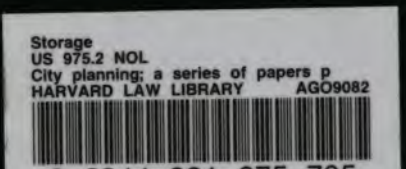

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The

National Municipal League Series

EDITED BY

CLINTON ROGERS WOODRUFF

Secretary of the National Municipal League

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Edited by CLINTON ROGERS WOODRUFF

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City Planning
Edited by JOHN NOLEN

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BIRD'S-EYE VIEW OF GENERAL PLAN OF WASHINGTON, D. C.

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NATIONAL MUNICIPAL LEAGUE SERIES

CITY PLANNING

A SERIES OF PAPERS PRESENTING THE ESSENTIAL ELEMENTS OF A CITY PLAN

EDITED BY

JOHN NOLEN

FELLOW AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS

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NEW YORK AND LONDON

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1916

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PREFACE

The other volumes so far issued in the National Municipal League Series have had to do mainly with the problems of organization and administration in cities. While this volume gives some attention to the study of conditions and tendencies as a basis for city planning and to the methods of executing plans through suitable legal and administrative machinery, it is concerned primarily with the planning of physical results.

This Handbook of City Planning is not an attempt to provide a comprehensive treatise. Nevertheless, it is not merely a loose collection of essays on city planning subjects, but a carefully related series which, taken together, cover the essential elements of a city plan. It deals with problems that confront practically all cities of any considerable size, and it presents the lines of investigation, planning, and control which have been found most sound in theory and most successful in practice in the cities and towns of the United States.

The handbook has been prepared first of all for the more serious and responsible part of the general public that seeks in compact and readable form reliable information and guidance as to the nature, purposes and methods of city planning. It is believed that the volume will be useful also to students of city planning and to practitioners in this and related fields as a convenient summary of American experience and an embodiment of good methods and practice.

At the end of each chapter there is a carefully selected list of books and articles on the chapter subject, and at the end of the volume a brief bibliography of the most authori-

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tative works and papers dealing with the subject of city planning as a whole, or with aspects broader than that of the single chapter. The text is well illustrated with appropriate diagrams, plans, and photographs.

The sixteen authors who have coöperated in the preparation of the volume are all men of recognized qualifications in city planning and virtually all of them have technical knowledge, experience, and reputation in the particular part of the city planning field with which their chapters deal. Brief biographical sketches follow the preface.

The editor's thanks are due to the authors of the several chapters for their valuable contributions; to Mr. Lawrence Veiller, to Mr. Andrew Wright Crawford, and to Mr. M. N. Baker for advice in working out the form and contents of this volume; to Miss Anna E. Monahan for painstaking and skillful editorial service, especially in the preparation of the bibliography; to Mr. Woodruff, the editor of the series, for his willing aid in helping to decide the many questions connected with the publication of a book of this character, and to Mr. Frederick Law Olmsted, who in addition to writing the introduction to the volume, has read and criticised all of the manuscript and given many valuable suggestions from his full knowledge of the subject and wide practical experience as a landscape architect.

JOHN NOLEN.

Cambridge, Massachusetts.
August, 1915.

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CONTRIBUTORS

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Frederick Law Olmsted, born Staten Island, N. Y., July 24, 1870; graduated Harvard, 1894. Studied landscape architecture under his father. Began practice as landscape architect, 1895. Landscape architect for Metropolitan Park Commission of Boston since 1898; Baltimore Park Commission since 1902; Roland Park Company, Baltimore, since 1898; Sage Foundation Homes Company, Forest Hills, Long Island, N. Y., since 1908; and for various other land companies. Member of Commission on Improvement of Washington, 1902; instructor in landscape architecture, 1901-3; professor since 1903, Harvard University. Member of National Commission of Fine Arts since 1910; member of the Board of Supervising Architects of the Group Plan, Cleveland, Ohio, since 1912, Brookline; Chairman of the Executive Committee, National Conference on City Planning, since 1910. As a member of the firm of Olmsted Brothers, has acted in a consulting capacity for and designed portions of the parks or other public improvements of the following towns and cities: Arlington, Mass.; Boston, Mass.; Bridgeport, Conn.; Cambridge, Mass.; Charleston, S. C.; Chicago, Ill.; Denver, Colo.; Detroit, Mich.; Hartford, Conn.; Lynn, Mass.; Malden, Mass.; New Haven, Conn.; Newport, R. I.; New York, N. Y.; Providence, R. I.; Rochester, N. Y.; Springfield, Mass.; Trenton, N. J.; Utica, N. Y.; Washington, D. C.; and numerous institutions, land subdivisions, and private properties. Author of numerous reports and articles on parks, municipal improvements, city planning and landscape architecture. Author of City Plan Reports relating to the following cities: Boulder,

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Colo.; Baltimore, Md. (both alone and jointly with A. W. Brunner and J. M. Carrere); Detroit, Mich.; Holyoke, Mass.; New Haven, Conn. (jointly with Cass Gilbert); Pawtucket, R. I.; Pittsburgh, Pa.; Rochester, N. Y. (jointly with A. W. Brunner); Utica, N. Y.; Woonsocket, R. I.; York, Pa.

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EDWARD H. BOUTON

Edward H. Bouton, born December 7, 1858. Since 1891 in charge of the development of Roland Park, Baltimore, Md.—a notable example of the best type of American land subdivision, including the treatment of local and minor streets. Upon the incorporation of the Roland Park Company, became General Manager, and is now President; Vice-President and General Manager of the Forest Hills Gardens, owned by the Sage Foundation Homes Company, and in active charge of the development of its property under the plans of Frederick Law Olmsted and Grosvenor Atterbury, 1909-12.

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Edward H. Bennett, born in England; graduated from the École des Beaux Arts in Paris, 1902; with D. H. Burnham, architect and city planner, for seven years; associated with Mr. Burnham in preparation of plans of San Francisco and Chicago. In addition has prepared plans of Portland, Oregon; Minneapolis, Minnesota; general plan of the Panama-Pacific International Exposition, 1915; Borough of Brooklyn, New York; Detroit, Michigan; Ottawa, the Capital of the Dominion of Canada; and the development of Grant Park, Chicago, for the South Park Commissioners.

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Arthur C. Comey, graduated from Harvard, 1907; Superintendent of Parks, Utica, N. Y., 1909-10; as landscape architect has made tentative city plan for Houston, Tex.; town plan for Dover, N. J.; suburban planning report, Detroit, Mich.; garden suburb plan, Billerica, Mass.; city planning studies, Woonsocket, R. I.; Lawrence, Mass.; Cambridge, Mass.; Fitchburg, Mass. In Australian Federal Capital Competition, plan placed fifth; in Chicago Quarter Section Competition, second prize; Richmond, Cal., land subdivision competition, first prize. Member, American Society of Landscape Architects; Massachusetts Homestead Commission; General Committee, National City Planning Conference. Secretary, Massachusetts Federation of Planning Boards. Author of many reports and contributor to magazines and current periodicals.

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E. P. Goodrich, born 1874; graduate of the University of Michigan with advanced degree; Civil Engineer in the United States Navy; Chief Engineer of the Bush Terminal in Brook-

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lyn; now Consulting Engineer of the Borough of Manhattan and the Board of Estimate; Expert to the Harbor Commission of Los Angeles, California; City Plan Expert for the City Plan Commission of Newark, New Jersey. Member of the American Society of Civil Engineers, American and International Societies of Testing Materials, American Concrete Institute, Permanent Organization of Navigation Congresses, Executive Committee of the National City Planning Conference.

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Commonwealth, in report—"Public Improvements for Metropolitan District," 1909; "Railroads—The Framework of City Plan," Second National Conference on City Planning, Rochester, New York, May, 1910.

BENJAMIN ANTRIM HALDEMAN

Benjamin Antrim Haldeman, born 1866; Assistant Engineer of the General Plans Division of the Bureau of Surveys of Philadelphia; work has covered practically all branches of municipal engineering and particularly those branches which are closely identified with what we now call city planning, such as the improvement and extension of the street and park systems, the abolishment of grade crossings, waterfront development, etc. Has given lectures on street planning and related problems; written a number of articles upon city planning subjects for technical societies and periodicals; delivered a course of lectures on town planning in the Summer School of the University of Pennsylvania.

JOHN VIPOND DAVIES

John Vipond Davies, born in South Wales, October 13, 1862; educated at Wesleyan College, Taunton, England, and at University of London. Early experience included engineering and construction of dry docks, mines, engines, etc. Came to the United States in 1889 and with Charles M. Jacobs formed the firm of Jacobs & Davies, consulting engineers. Chief Engineer of Montauk Water Co. Designed and constructed in 1892 the Ravenswood Tunnel for East River Gas Co., between 71st St., Manhattan, and Long Island City. As Chief Engineer, designed and constructed West Virginia Short Line R. R. (now part of B. & O. R. R.), and also designed and constructed Kanawha & Pocahontas R. R. (now part of C. & O. Ry.). Consulting Engineer of Ohio River R. R.; Chief Engineer of Atlantic Avenue Improvement of Long Island R. R. in Brooklyn, on the

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elimination of grade crossings through that city. Consulting Engineer to City of Detroit on water supply tunnel under Detroit River; Engineer-in-Charge for contractors of terminal improvements of N. Y. C. R. R., Grand Central Terminal, New York, and Consulting Engineer for N. Y. & L. I. R. R. for tunnel under East River; Deputy Chief Engineer (his partner, Mr. Jacobs, being Chief Engineer), and later Chief Engineer, designed and constructed four tunnels under Hudson River for Hudson & Manhattan R. R., and its tunnel system under New York and New Jersey. His firm, Jacobs & Davies, have recently completed a deep level tunnel from Astoria, Long Island, to the Bronx, New York, for Consolidated Gas Co., and have recently completed a hydroelectric power dam and navigable lock across Tennessee River for Chattanooga & Tennessee River Power Co., and also 26 tunnels of various lengths in Mexico, comprising the hydraulic development of the Mexican Light & Power Co. to supply light and power to Mexico City and the Federal District; Consulting Engineer for Brooklyn Rapid Transit Co. in connection with its new subways, tunnels, and elevated lines in the Boroughs of Manhattan and Brooklyn, New York City, and directed for the B. R. T. Co. the work of alteration of the Centre Street Loop, in Manhattan, and the work of construction of complicated system of subways, yards and tracks at 38th Street, Brooklyn. His firm designed and supervised construction of a tunnel under the Seine River and across the Place de la Concorde for the Metropolitan Ry., Paris, France, and also designed and constructed the 4-track subway under existing subways, surface and elevated railroads where several of these converge and cross one another at Flatbush and 4th Avenues, Brooklyn, being a part of the 4th Avenue Subway System being constructed by City of New York.

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to the Committee on the City Plan and the Advisory Commission on City Planning of the Board of Estimate and Apportionment of New York City; Consultant to the Commission on Building Districts and Restrictions of New York City; Consultant to the City Planning Commissions of Newark and Jersey City, N. J. City Planning Lecturer, Columbia University. Delegate U. S. Government to the Ninth International Housing Congress, Vienna. Chairman of the Committee on Town Planning of the American Institute of Architects and Editor of the Town Planning and Housing Department of the Journal A. I. A. Member of the firm of Geo. B. Post & Sons, Architects, New York City.

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FLAVEL SHURTLEFF

Flavel Shurtleff, born 1879; graduated Harvard College, 1901; LL.B., Harvard, 1906; now engaged in the practice of law. Secretary of the National Conference on City Planning

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since its organization in 1909. Editor: "The City Plan." Author: "Carrying Out the City Plan: The Practical Application of American Law in the Execution of City Plans." Published by The Survey Associates, Inc., New York. 1914.

CHARLES MULFORD ROBINSON

Charles Mulford Robinson, of Rochester, N. Y., was born in 1869. He graduated from the University of Rochester, from which he has since received the honorary degree of Master of Arts. He has written extensively for the leading periodicals—on one occasion was sent abroad by *Harper's* to prepare a series of articles on municipal esthetics—and is the author of several books. The first of these, "The Improvement of Towns and Cities," has now been reprinted ten times. "Modern Civic Art" is in its third edition. The first edition of "The Width and Arrangement of Streets," published much later, is exhausted and has been followed by a revised and amplified edition under the title, "City Planning, With Special Reference to the Planning of Streets and Lots." In that volume the subject matter of this chapter is more fully discussed and is supplemented by references to foreign legislation.

In addition to writing books, Mr. Robinson has had much practical experience in the diagnosis of city conditions and needs, some thirty cities and towns from the Atlantic coast to the mid-Pacific having retained him for that purpose. Most of these reports have been issued in book or pamphlet form. Since 1913, Mr. Robinson has held the appointment of Professor of Civic Design, on part time, at the University of Illinois, the first chair on that subject in the United States having been created for him.

J. HORACE McFARLAND

J. Horace McFarland, Master Printer and Illustrator; established Mt. Pleasant Press, Harrisburg, Pa.; member for many years of Harrisburg Park Board, until it was abolished by

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"commission" government. Author of "Photographing Flowers and Trees," "Getting Acquainted with the Trees," "My Growing Garden," "Planting the Home Grounds," and numerous magazine articles on outdoor life and recreation; also lecturer on outdoor life and on civic improvement work. President of American Civic Association; Vice-President National Municipal League; Vice-President Pennsylvania Conservation Association; President Eagles Mere Forest Reserve Association; Secretary, Municipal League of Harrisburg. Has conducted campaign for preservation of Niagara Falls and for protecting and developing National Parks, and has assisted in management of four campaigns for extensive local municipal improvements.

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INTRODUCTION BY THE GENERAL EDITOR

"City planning" is a phrase much more often used than defined. There was a time, and that less than a score of years ago, when it was practically a synonym for the "city beautiful"; but now it has a much richer, a much more comprehensive meaning. This development has been synchronous with the growth of the movement to place our cities upon a more substantial, a more reasonable, a more useful basis. Henry R. Aldridge, the secretary of the English National Housing and Town Planning Council, and a veteran in the cause of town planning, declares in his new book ("The Case for Town Planning") that the phrase should come "to all clear-headed administrators as an appeal for the substitution of order in place of chaos in town growth. To those members of municipal committees who are responsible for the guardianship of the health of the population, the appeal should be that of the wisdom of prevention as compared with the wastefulness of cure. . . . To those responsible for the wise administration of municipal revenues the appeal is direct and strong. They have witnessed for many years the waste of the ratepayers' money on clearance schemes, on road-widening schemes, and on many other schemes which would never have been necessary at all if town planning care and foresight had been exercised. To them the case for town planning on the financial side is overwhelming. They realize that the sick man is a burden to the community, whilst the healthy man is an asset. The one has to be carried; the other carries

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his own burdens and helps to carry the burdens of others."

Some idea of the growth of the demand for definite, intelligent, expert, official planning of our cities may be gathered from the fact that in 1907 there was a single permanent city planning commission in the United States—that of Hartford, Connecticut; and none so far as I know in Canada. Today according to the *National Municipal Review*, which bases its figures on the records of the National Conference for City Planning, there are 97, distributed as follows: Massachusetts, 45; Rhode Island, 1; Connecticut, 6; New York, 6; New Jersey, 4; Pennsylvania, 18; Maryland, 2; Ohio, 1; Illinois, 1; Michigan, 1; Minnesota, 1; Missouri, 1; Kansas, 1; Nebraska, 1; Kentucky, 2; Louisiana, 1; California, 5. Canada now has an official adviser, Thomas Adams, connected with the Canadian Conservation Commission.

It is preëminently fitting that a volume on American city planning should be the product of a congeries of minds. Dr. John Nolen, himself an inspiring leader along both popular and technical lines, has brought together in this volume the ripe thought of the men who *are* the city planning movement in American cities. Through all the chapters runs a line of high ideals and a happy confidence in the zeal, intelligence and aspirations of the American people when thoroughly aroused.

This volume is sent forth with the hope and belief that it will aid in giving definite form and content to the developing aspirations for an orderly planning of our cities as communities where life may be truly worth living.

CLINTON ROGERS WOODRUFF.

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CITY PLANNING

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CITY PLANNING

CHAPTER I

INTRODUCTION

City planning is the attempt to exert a well-considered control on behalf of the people of a city over the development of their physical environment as a whole. Although most of the elements of the subject have been long under discussion and have accumulated an extensive literature, books purporting to treat of city planning are few in number and all of recent date. Indeed the term itself, and its equivalent, "town planning," have come into use only within a few years.

The new and significant fact for which this new term, "city planning," stands is a growing appreciation of a city's organic unity, of the interdependence of its diverse elements, and of the profound and inexorable manner in which the future of this great organic unit is controlled by the actions and omissions of today.

We are learning how, in the complex organism of a city, anything we decide to do or leave undone may have important and inevitable consequences wholly foreign to the motives immediately controlling the decision, but seriously affecting the welfare of the future city; and with our recognition of this is growing a sense of social responsibility for estimating these remoter consequences and giving them due weight in reaching every decision.

City planning stands not only for a longer look ahead in

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planning municipal improvements than has been customary in the past, but especially for a broader and more penetrating vision of the interrelations between apparently distinct lines of planning in cities, and of the profound influence which activities carried on in one part of the field, and with a view to one set of purposes, may have upon conditions in another part of the field. It takes account of the influence of street plans and depths of blocks upon the prevailing type of building and thus upon the amount of light and air and privacy in the people's dwellings; of the effect of railroad locations on the distribution of factories and on the congestion of population and character of housing; of the economic interrelation between water-supply lands and park lands; of the social and economic values to be secured by grouping numerous educational and recreational functions which have ordinarily been separated; and of other combinations innumerable.

City planning thus conceived has a breadth and ramification at once inspiring and appalling. Any mind with sufficient imagination to grasp it must be stimulated by this conception of the city as one great social organism, whose future welfare is in large part determined by the actions of the people who compose the organism today, and, therefore, by the collective intelligence and will that control those actions. The stake is vast, the possibilities splendid. The ideal of a unified, intelligent, and purposeful control of the city's entire development follows obviously and logically from the conception of the city as a social unit with its fate in its own hands. The complex unity of the subject and the absence of definite limitations upon its scope add to the strength of its appeal to the imagination. Nothing which may conceivably become a part of the city or affect the city's future can logically be excluded from its field. It will embrace the most diverse branches of specialized science and technique applied to urban affairs, including countless phases

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of engineering, sanitation, economics, and finance, and every art which can minister to the happiness and welfare of an urban population.

But the very qualities which give strength to city planning in its appeal to our hopeful idealism stand as obstacles in the path of its practical application. Every man of affairs who has learned how to get things done in the world, no matter how profound his respect for science and research, no matter how clear his conviction that it pays to investigate the pertinent facts before reaching any decision, is keenly aware that if he waited to examine all the factors which might possibly bear on the wisdom of any decision, or to consider all of its consequences, he would never get around to making the decision at all. He relies upon his common sense to fix an arbitrary limit upon the factors which he will take the time to weigh before forming his judgment and proceeding to action in any particular case. And from this point of view the new social ideal of unified and comprehensive city planning, insisting that it is a duty to study and provide for the remoter needs of the city and to consider the remoter consequences of every change proposed, may easily appear a counsel of theoretical perfection, leading into a fathomless ocean of investigations, and encumbering the route toward effective practical accomplishments. The answer is, of course, that any ideal must be applied with common sense and with due regard for the human limitations of time and place.

The common-sense application of the city planning ideal may be phrased thus: Whether they like it or not, whether they know it or not, a collective responsibility rests upon citizens of the present generation for making or marring their city's future in countless ways. It is utterly beyond their power, or that of their agents, to discharge that responsibility with complete knowledge or infallible wisdom; but it is reasonable that they should use a moderate amount of

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their collective energy and wealth in a deliberate and conscientious effort to meet the responsibility as well as the available means permit.

It is of very secondary importance what kind of agencies are employed in the effort. That is wholly a matter of local and temporary expediency; as is also the question of how careful and thorough and costly the investigation and planning ought, in common sense, to be. But, from the very nature of cities, there are certain classes of problems which confront them all, and certain common lines of investigation, planning, and control which are especially apt to be worth while.

In the following chapters of this book some of the most important of these lines are discussed from varying points of view. The reader must draw from them a suggestion of how the same points of view and methods of thought might be applied to other aspects of the many-sided problem—aspects which might well be more important in a given city than those which are here discussed, since it is clearly impossible in a book of this compass to deal with more than a limited selection of the more important problems of frequent recurrence.

It will, perhaps, help the reader in bridging the inevitable gaps to rehearse here very briefly a general classification of the physical subject matter of city planning, with comments indicative of the present trend of thought in relation to the same.[1]

City planning may conveniently be considered under three main divisions: The first concerns the means of circulation —the distribution and treatment of the spaces devoted to streets, railways, waterways, and all means of transportation and communication. The second concerns the distribution and treatment of the spaces devoted to all other public pur-

[1] Based on the author's address at the National City Planning Conference at Rochester, N. Y.

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poses. The third concerns the remaining or private lands and the character of developments thereon, in so far as it is practicable for the community to control or influence such developments.

Facility of communication is the very basis for the existence of cities; improved methods of general transportation are at the root of the modern phenomenon of rapid city growth; and the success of a city is more dependent upon good means of circulation than upon any other physical factor under its control.

Moreover, the area devoted to streets in most cities (excluding those regions that are still undeveloped) amounts to between 25 and 40 per cent of the whole, and the improvement and the use of all the remainder of the city area, both in public and in private hands, are so largely controlled by the network of subdividing and communicating streets that the street plan has always been regarded as the foundation of all city planning. But even as to streets, plans drawn primarily in the interest of easy communication, with a view to the common welfare of all the citizens, and by agents responsible to them, have been unusual.

It is an interesting consideration that most of the street planning in America, and until recently in Europe, has been done from the proprietary point of view. Nearly all new city and town sites that have been deliberately planned, whether well or ill, have been planned by or for the proprietors of the site, largely with a view to successful immediate sales. Moreover, the methods, traditions, and habits created in this school have inevitably dominated in large measure those official street planning agencies which the people of some cities have subsequently established with the purpose of exercising a control in the interest of the whole community over the street layouts of individual proprietors.

Such public agencies, equipped with adequate powers, and

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so organized as to have any strong initiative and to accomplish important results on the general plan of the city, have been comparatively few in this country; but many people whose interest in this fundamental aspect of city planning has only recently been aroused seem to be quite unaware what a great amount of long-continued, patient, laborious effort has been spent and is being spent daily on such work by intelligent and well-intentioned city officials. Their hands are often tied by lack of adequate power and by lack of any supporting public opinion; they often fail to show that breadth of outlook and strength of initiative that would be desirable; too often their ideals of street planning are formed in a narrow school and a bad one; and sometimes they are unrighteously influenced by speculative and proprietary interests against the general welfare; but, taken by and large, they are doing the best they can to control the street development of their cities wisely. There is need of more power for them, more public understanding of their work, and the development of a better and broader knowledge and appreciation on their part of the technique of city planning.

It is to be noted that the ruts in which the planners of streets have generally been running in America were deeply worn before the beginning of the modern revolution in means of transportation, which dates from the introduction of metal rails and the development of the steam engine. That revolution has been made by such moderate successive steps, and the men to whom the improved transportation is due have so seldom had any responsibility for street planning, and have so generally had their attention absorbed in the immediate practical problems of getting improved means of transportation as easily and cheaply as they could, under the actual conditions which they found confronting them, that street planning has gone along in the same old routine way, and each improvement in the means of urban

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transportation has been fitted to the old Procrustean bed of the street planner.

Steam railroads, developing mostly in the open country, early began to learn the extent to which their efficiency depended upon a standard as to ease of curvature and lightness of gradient that put their planning in a wholly different category from that of the old type of thoroughfare; and somewhat more slowly they began to learn the importance of a complete separation from other kinds of traffic, even at crossings. Although in the earlier days the existing streets were often used by the railroad in entering or passing through a town, the tendency became gradually stronger to disregard the hampering streets, and lay out steam railroads, even in cities, upon functional lines suitable to great long-distance thoroughfares operated at high speed. This divorce meant a great improvement to the railroads, but it left the street system to stagnate in the old ruts, and tended to a total disregard of the relation between the streets and the railroads as distinct but complementary parts of one system of circulation. Yet, even so, one of the most important influences in securing departures from the gridiron plan, in the direction of more varied and convenient lines of communication, has been the reluctant recognition in street layout of the obstacles to a wholly arbitrary plan offered by the presence of radial and other functional lines of railroads established before the extension of the city. Accompanying this influence, of course, has been that of the old country highways, which were often laid out solely with an eye to their convenience as direct transportation routes, especially on radial lines, unhampered by what I have called the proprietary point of view as represented by the "subdivider" of land. Only in those regions where the proprietary point of view distorted everything, through rigid adherence to the rectangular system of government surveys and land sales, are these radial thoroughfares entirely lacking.

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But if the long-distance and suburban steam railroads thus divorced themselves from the antiquated methods of the street planners, all other improved means of transit have been, as a rule, bound hand and foot by them. Horse cars, mechanically propelled street cars of all sorts, and rapid transit railways, whether above or below the street grade, have generally been limited to streets laid out on plans that embodied scarcely any features that had not been common in city street plans for many centuries. The one important exception was that the average width of street became greater. The routes which street-car and transit lines have had to follow have often been full of angular turns, have seldom been well distributed in relation to the area and the population, and, in the case of surface lines, have been encumbered by a large amount of general vehicular traffic, for which adequate provision, separate from the car tracks, has been lacking.

It has thus been the tendency of street planners, whether acting for the city or for landowners, to give quite inadequate attention to the need of the public for various types of main thoroughfares laid out with sole regard to the problems of transportation,[1] and to permit the supposed interests of landowners and the fear of heavy damages to limit the width of thoroughfares and force them out of the best lines in order to conform to the owners' preferences as to land subdivision. But, at the same time, there has been a decided tendency on the part of official street planners to insist, with a quite needless and undesirable rigidity, upon certain fixed standards of width and arrangement in regard to purely local streets, leading in many cases to the formation of blocks and of lots of a size and shape ill adapted to the local uses to which they need to be put. The typical instance of the latter tendency is that of insisting on wide blocks and deep lots in a district occupied by people

[1] *See* Chap. XIII.

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whose rents must be low and accommodations correspondingly limited; narrow, deep, dark buildings or rear tenements, or both, are the almost inevitable economic results. Another instance is that of fixing a minimum width of street and minimum requirements as to the cross section and construction thereof which make the cost needlessly high for purely local streets, and thus inflict a wholly needless and wasteful burden of annual cost upon the people.[1]

Without more than alluding to the immensely important and complex relations between the street system, the railroad lines and terminals, the wharves, the navigable waterways, and the sites for economical warehousing and manufacturing,[2] it is enough to say, in summary, that there is great need of treating all the means of circulation in a city as a single connected system, and at the same time of recognizing clearly the differentiation of its several parts, so that each shall fit its function amply but without waste, from the biggest railroad terminal down to the smallest alley.

In addition to the above-mentioned means of circulation, which provide for the conveyance of passengers and freight, some other specialized means of circulation often have to be provided. The pipes and wires for distributing water, gas, electricity, etc., and for the removal of sewage, normally form a part of the streets; but it is sometimes expedient to make provision for one or more of these services separate from the streets. For example, in suburban residential districts without alleys, a special easement for pole lines and other such purposes is often laid out along the rear lot lines in order to keep overhead wires out of the streets. But the most universal and important of the special means of circulation are the channels for the discharge of storm water. Storm-water sewers built in the streets are insufficient to discharge the water of great storms from large areas. If

[1] *See* Chaps. II and IV.

[2] *See* Chaps. XI, XII, and XIII.

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adequate channels in the form of brooks and rivers and canals are not kept open, exceptional storms are bound to cause disastrous floods.[1]

The second main division of the physical environment which city planning attempts to control is a very miscellaneous one, including all the public properties in a city not used primarily for circulation; but they may be grouped for the purposes of this review into three principal classes.

Class A may be called that of central institutions, serving the whole city and requiring for convenience a comparatively central position; such as the city hall and the head offices of public departments and services, both municipal and otherwise, the public library, museums, central educational establishments, and the like, together with the grounds appurtenant to them. Functionally, it is important to class with these, as far as practicable, similar institutions of a quasi-public sort, even though owned and operated by private individuals or corporations, such as the leading establishments devoted to public recreation, dramatic, musical and otherwise, with a clientele covering the whole city. One of the greatest needs in regard to all matters of this sort is the application of intelligent effort to the grouping of such institutions at accessible points in so-called civic centers, for the sake of convenience and of increased dignity and beauty.[2]

Class B consists of institutions serving limited areas, and, therefore, needing to be repeated in many different places throughout the city. Such are schools, play-grounds, gymnasia and baths, branch libraries, branch post-offices, police stations, fire-engine houses, district offices and yards of the department of public works and other public services, neighborhood parks and recreation grounds, voting places, public and quasi-public halls and social centers, and so on, includ-

[1] *See* Chap. X.
[2] *See* Chap. V.

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ing in the same class, so far as practicable, the local institutions conducted by private organizations but serving a considerable local public. The most notable thing about this class of institutions is that, while most of them belong to the city and are, therefore, entirely under the city's control as to location and character, the selection of sites is ordinarily determined by separate departments, without the slightest regard to the selections of other departments, or the possibilities of economy, convenience and esthetic effect that might result from combination or grouping. Even in the separate departments, it appears to be a rare exception that any considerable degree of comprehensive foresight is exercised in selecting sites with a view to economy of purchase, or to securing a convenient and equitable distribution.

We shall not have intelligent city planning until the several departments responsible for the selection of sites for all the different public purposes of a local character get together in laying out a general plan and method of securing such sites, forming in many cases local civic centers in which the respective neighborhoods can take pride.[1]

Class C of public properties consists of many special institutions not demanding a central location but serving more than a local need, such as hospitals, charitable and penal institutions, reservoirs and their grounds, large parks and outlying reservations, parkways, cemeteries, public monuments, and certain monumental and decorative features to be found in connection with open spaces that exist primarily for other purposes.[2] In this class, the opportunities for economy and better effects through combination and grouping of sites are not so numerous, and what seems to be most needed is a more far-sighted regard for the relation of each of these important institutions to the probable future dis-

[1] *See* Chaps. VI and VII.

[2] *See* Chaps. VI, VII, VIII, and X.

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tribution of population and to the main transportation routes. In every case, the adaptability of the site to its particular purpose needs to be considered with the best of expert advice; but, in addition, those properties which occupy considerable areas, like the large parks and cemeteries, need to be considered from a double point of view, as obstructions to the free development of the street and transit systems, and as places to and from which large numbers of people must be carried by those systems.

The third main division of the physical city is that of lands in private ownership and all the developments on such land. It may be held that these form the real city, and that the elements heretofore considered are merely auxiliary to these. Certainly it would contradict our definition of city planning if this most important part of the entire physical environment of the people were not to be suitably planned and controlled. And yet the extent to which collective control over private property may properly be carried is a debatable, and very much debated, matter. Such control is exerted chiefly in three ways:

The street plan absolutely fixes the size and shape of the blocks of land, and hence limits and largely controls the size and shape of individual lots and of the buildings which can be most profitably erected upon them.

The methods of taxation and assessment greatly influence the actions of landowners, and of those having money to invest in land, buildings, or building mortgages. These methods have a direct influence upon the speculative holding of unproductive property; upon the extent to which development is carried on in a scattered, sporadic manner, so as to involve relatively large expense to the community for streets, transportation, sewerage, etc., in proportion to the inhabitants served; upon the quality and durability of building; and, in those states where property is classified and taxed at varying rates, upon the class of improvements

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favored. Exemption from taxation for a certain period, or other similar bonus, is a familiar device in some cities to encourage a desired class of developments, such as new factories.

But the most direct and conspicuous means of controlling developments on private property is through the exercise of the police power, as in the case of building codes, tenement-house laws, and special district regulations. The first object of building codes, and of the system of building permits and inspections through which they are enforced, is to ensure proper structural stability. A second object is to reduce the danger of fire to a reasonable point. A third object is to guard against conditions unreasonably dangerous to health. Tenement-house laws, factory laws, and other special provisions operating in addition to the general building code of a city, are directed mainly toward the protection of people using special kinds of buildings, against unhealthful conditions and against personal risks from fire and accident. Buildings are classified according to the purposes for which they are used, according to their location with respect to arbitrary boundaries (such as "fire limits"), according to the materials of which they are built, and in dozens of other ways; and for each class, minute and varied prescriptions and prohibitions are made which, in the aggregate, play an important part in determining the size, height, purposes, plan, general appearance, and cost of the structures which a lot owner can erect and those which he can expect his neighbor to erect. The amount of light entering any given window in a city, and, in a general way, the amount of air, is dependent mainly upon the distance to the next opposite building wall and the height to which that wall rises above the level of the window. An examination of the building codes and tenement-house laws of thirty-five American cities shows a confusing diversity in the regulations limiting building heights and horizontal spaces to be

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left open, and there are some cities in which there is practically no effective regulation at all.

While such regulations are intended only to guard against the evil results of ignorance and greed on the part of landowners and builders, they also limit and control the operations of those who are neither ignorant nor greedy; and it is clear that the purpose in framing and enforcing them should be to leave open the maximum scope for individual enterprise, initiative, and ingenuity that is compatible with adequate protection of the public interests. Such regulations are, and always should be, in a state of flux and adjustment—on the one hand with a view to preventing newly discovered abuses, and on the other hand with a view to opening a wider opportunity of individual discretion at points where the law is found to be unwisely restrictive. In a country which relies for its progress primarily upon individual initiative under the stimulus furnished by the institution of private property, the major part and the most intimate part of the physical environment of the people—their workshops and their dwellings—must inevitably be in private ownership. And unless we make the revolutionary change of putting our main reliance on collectivism, we must avoid going so far in the collective control over private property as to make the mass of property owners feel that they are no longer free and responsible beings with their destiny in their own hands.

The nature of public control over private real estate as a part of city planning, especially under the police power, is so fully discussed in Chapter III that it is proper to pass it over here with a reference far briefer than its importance in relation to other parts of this outline would suggest. But it seems necessary to consider what looks to some people like a fundamental conflict between the new city planning ideal of a unified control over the entire physical city and the basic ideals of an individualistic democracy.

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Like other aspects of public affairs city planning can be approached from either of two contrasting viewpoints. Those approaching it from one side lay great stress upon efficiency, upon that concentration of authority without which the greatest efficiency is impossible, and upon the application of rigorous scientific methods. In all of which they are absolutely right. But they are apt to underestimate the difficulty of deciding wisely what ends ought to be thus efficiently and scientifically pursued, and to feel a serene confidence in their own ability or that of some expert or some bureaucratic group to settle just what the community should aim at as well as to direct the executive business of pursuing those aims. This attitude is rather characteristic of the able and efficient city planning authorities in Germany, despite the fact that they have pointed out how their predecessors in the earlier days of German city planning were notably efficient in doing exactly the wrong things. Those who have this easy confidence that wisdom in selecting the ends to be pursued, like efficiency in gathering data, in devising means, and in putting them into execution, is to be obtained mainly by concentration of authority and reliance on experts, are apt to distrust and dislike the groping, blundering process by which democratic public opinion is formed and modified. In other words, they are apt to have the temper of mind which we call aristocratic or bureaucratic. If they entertain the hope that a majority can be brought to their way of thinking, they may call themselves socialists, or social-democrats, or something of that sort. Whether proletarians or aristocrats they are alike willing to subordinate individual initiative on the part of most of the people to the initiative of some central authority.

Advocates of city planning who approach it from the opposite viewpoint are also eager for efficiency and consequently for a sufficient concentration of authority to make possible a high degree of administrative efficiency, and they

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recognize clearly that the greatest attainable good for the individuals who constitute a community today and those who will constitute it in the future can be had only by joint action for harmonizing the more wasteful or injurious conflicts of individual enterprise. But they have a saving humor which recognizes that any group of people, including themselves, will always combine a substantial percentage of error along with their wisdom, and will cling to the one almost as tenaciously as to the other. They accept the rather sardonic definition of an efficient executive as "one who decides quickly and is sometimes right;" but to prevent the diligent and efficient pursuit of mistaken ends from being continued until the very authors of the mistakes can see them, they rely upon the common sense of all the people as the safest possible control. In other words, they are democrats.

And they recognize that the social development of cities is a complex evolutionary process of which the most thorough scientific study can give only a partial understanding; a process identical with the development, in their social relations, of the individuals who compose the city; a process dependent upon the active play of individual efforts and conflicts. They look to city planning in its control over developments on private property not as something to supersede individual initiative, but as a means of expressing and defining the kind and degree of discipline under which individual initiative can attain for itself the best all-round results.

As long as city planning control over private property is pursued in this democratic, modest, common-sense spirit, there is no vital danger to be feared even from wholly unprecedented applications of the police power. The entire subject, so conceived, is free from any necessary connection with the faults of the centralized, arbitrary, bureaucratic control to be found in some German cities, or with the theorizing extremes of socialists or single taxers.

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We have considered the three main divisions of city planning, dealing respectively with the lands devoted to the means of circulation, the lands devoted to other public purposes, and the lands in private ownership. Within all of these divisions, the actual work of city planning comprises the following steps: The first step is a study of conditions and tendencies, a survey of the pertinent facts and an estimate of the most probable future changes in those facts. The second step is a definition of purposes to be attained. The third step is the planning of physical results suitable to these purposes. The fourth and last step is the bringing of those plans to execution through suitable legal and administrative machinery. Every one of those steps of progression is vital; every part of the three main divisions of the field is important. The following chapters of this book, written by as many different men, illustrate typical parts of the field considered from the point of view sometimes of one step of progression, sometimes of another.

As a final word of introduction, it may be well to emphasize another principle which, if fully appreciated, makes for an effective unity of design in city planning, in spite of the diversity in its problems and in the technical training required to meet them. Every element in their physical environment affects the people in some degree both on the economic side, as determining their efficiency, and on the esthetic side, as determining their enjoyment of life. Therefore, in the design of everything which enters into the city, both of these aspects must be given weight.

The demands of beauty are in large measure identical with those of efficiency and economy, and differ mainly in requiring a closer approach to perfection in the adaptation of means to ends than is required to meet the merely economic standard. So far as the demands of beauty can be distinguished from those of economy, the kind of beauty most to be sought in the planning of cities is that which results

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from seizing instinctively, with a keen and sensitive appreciation, the limitless opportunities which present themselves in the course of the most rigorously practical solution of any problem, for a choice between decisions of substantially equal economic merit, but of widely differing æsthetic quality.

Regard for beauty must neither follow after regard for the practical ends to be obtained nor precede it, but must inseparably accompany it.

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CHAPTER II

THE SUBDIVISION OF LAND

Recent progress in city planning has brought increasing conviction of the *interrelation* of one part of the subject to another. For example, the proper subdivision of land directly affects and is affected by the street system, by transportation and recreation facilities, by restrictions upon the use of private property, by schemes for industrial and residential decentralization, and by other matters to which special chapters in this volume are devoted. So far as possible, therefore, this discussion of land subdivision in its relation to city planning will confine itself to those phases of the subject which are not covered elsewhere in the book. It will assume, especially, the existence of a system of main thoroughfares, and the restrictions upon private property discussed in detail in another chapter, including the districting of a city.

Main Classes of Land Subdivision

Broadly speaking, city land, from the point of view of land subdivision, may be put into three main classes, namely: land for industrial use, land for retail and wholesale business, and land for residential purposes.

The subdivision of land for industrial use varies so much with the different requirements of industries that it is not possible to set down any rules for its laying out except those that are common to all planning that has to do with land. Some industries can be well accommodated on an ordinary

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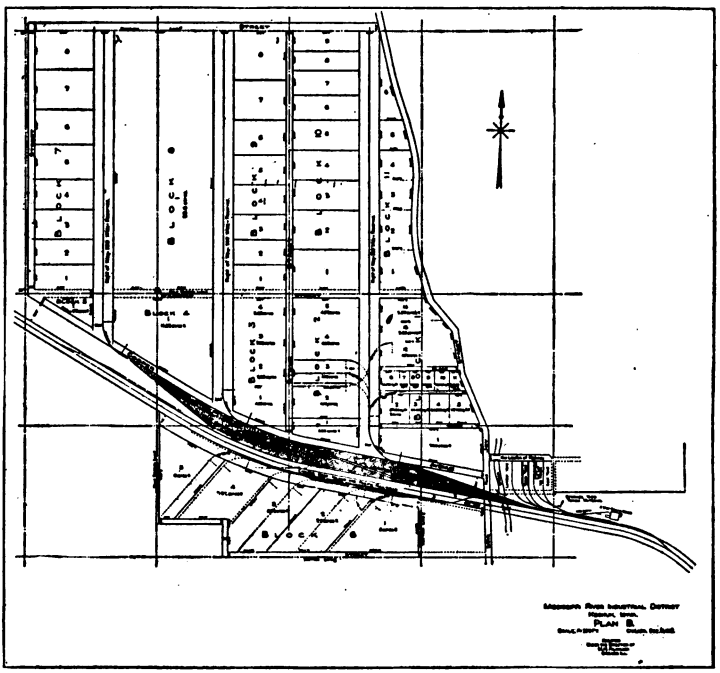
city lot, while others require hundreds of acres, portions of it in large blocks undivided by public streets. It is more and more evident that economic and other advantages, especially in the case of large industries, follow from the loca-



MISSISSIPPI RIVER INDUSTRIAL DISTRICT, KEOKUK, IOWA
Showing subdivision of land for industrial use

tion of such establishments away from the densely built-up sections of cities.[1]

Retail business property also varies in its requirements as to land, but not to so great an extent as property for

[1] *See* Chap. XV; also John Nolen, "The Factory and the Home," in *Proceedings of the National Housing Association,* Philadelphia, (1912).

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PLAN RECEIVING FIRST PRIZE IN THE COMPETITION FOR THE SUBDIVISION OF A QUARTER-SECTION OF LAND CARRIED ON BY THE CHICAGO CITY CLUB

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industrial use. Except in the case of new cities, laid out in advance of settlement, city business buildings usually occupy land that was originally laid out for residential use. The business districts of our cities grow naturally by extending more and more into surrounding residential neighborhoods. It is this fact which makes important the reasonable adaptability, if need be, of residential property for business purposes. As a general rule, business has much less choice than industries and residences in the selection of localities in which it may be successfully established. The locations for business are determined largely by the street and transportation system, by street widths and grades, and by proximity to existing business centers. Normal business requirements are fairly well met by such lot units as those typical of New York City, which are uniformly 100 feet deep, and 25 feet wide in Manhattan and the Bronx, and 20 feet wide in Brooklyn, Queens and Richmond. This makes a block (without alleys) 200 feet deep. The length of the blocks varies from 500 to 800 feet; a block over 600 feet in length places the streets in a business district too far apart. The important factor is the depth of lots. Business readily adjusts itself to lot width, and gets about what it wants in street frontage. In the matter of depth, however, business is almost equally embarrassed by much variation above as below 100 feet. In the case of very large business houses, such as department stores, hotels, and office buildings, where the demand is abnormal, the special requirements are easily met by taking the double depth of lots, thus extending the building from street to street.

The Subdivision of Residential Property

The principal field of land subdivision, however—the class which concerns at least two-thirds of all city land—is resi-

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dential property. In fact, when land subdivision is spoken of, it is ordinarily assumed that it refers to the laying out of land for dwellings. The evils of undesirable and unintelligent land subdivision in the case of residential property are also more apparent and more in the public eye, although perhaps not more important, than in the case of industrial and business property. There is a widespread feeling in this country and abroad that city planning has thought more of streets, of civic centers, of parks and playgrounds, and of other subjects, than it has of housing. English and German town planners are constantly asking: "Why is housing not given more attention by city planners in the United States?" For example, one English writer recently said: "In America it is the fear of restricting or injuring free and open competition that has made it so difficult for cities to exercise proper and efficient control over their development. The tendency, therefore, has been to promote those forms of civic improvement which can be carried out without interfering with vested interests. To impose severe sanitary restrictions, to limit the height and density of dwellings, or to prevent the destruction of amenities on privately owned land, may all help to reduce the profits of the speculator—hence if he has any influence over the local governing bodies, he will secure that nothing but what is absolutely necessary and legal shall be done in these directions. But to purchase large public parks and to develop civic centers adds to the value of the privately owned land and buildings in the city. Unsanitary homes are more bearable, and good class residences will produce higher rents, when they are adjacent to public open spaces." This criticism is typical of many others, and in the main it is true.

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Reasons Why Land Subdivision Has Not Been Given More Attention

There is much to be said, however, in explanation of this criticism. There are reasons why land subdivision has not been given more attention by city planners in this country. Some of the more important are the following:

1. Until recently, aside from a few large cities and other more or less exceptional developments, the characteristic housing in American towns and cities has been relatively good, so far as the subdivision of the land and city planning could affect it one way or another. The actual lots as built upon have been, usually, from 25 to 40 feet in width, and 100 feet or more in depth, with eight or ten houses, or less, to the acre—the standard of English garden city density.

2. The rights and limitations of American municipalities have been such that matters controlled by land subdivision—that is, location, width, etc., of streets, width and depth of lots, and the general character of houses—have often been largely determined before the outlying sections have been included within the city boundaries, and there has been practically no effective control of such matters by rural or county governments.

3. Public opinion generally was not—and, in fact, is not yet—favorable to the strict public regulation and control of the laying out of residential neighborhoods. It is, indeed, very difficult to make an advance, even in sanitary requirements, in measures for the reduction of fire hazard, and in the reasonable protection of light and air—administrative regulations which might naturally be expected to receive attention in advance of broad city planning. A leader in American housing reform has said that "the housing problem, as we know it in America, is largely a sanitary problem. It is chiefly the problem of good municipal house-

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keeping, the prompt removal of garbage, rubbish, and other waste materials from the homes of the poor, the cleanliness of streets and alleys, the provision of adequate water supply in convenient locations, proper sanitary conveniences in the place of antiquated expedients." At any rate, there is a widespread feeling that public-health matters of this sort should have first attention. Thus, the obstacles to regulating and controlling land subdivision are greatly increased in this country by the *laissez-faire* doctrine, by what is known as the rights of individual property, and by the strength of vested interests.

4. On account of the Federal Constitution, which provides that private property cannot be taken except for public use, and with due process of law and just compensation, and on account of the conservatism of our courts in interpreting the Constitution and the law, it is always very difficult, and often very costly, to regulate or control land subdivision by public authority. In many cases the state constitutions follow the Federal Constitution.

5. The disinclination of private capital, except in the case of a few employers for their own employees, to respond to invitations and opportunities to invest in housing schemes on the limited dividend principle, yielding only the normal business interest on invested funds of, say, five or six per cent., is another reason why housing and land subdivision have not apparently been given more attention in this country by landscape architects and town and city planners. Coöperation in housing schemes, as in other matters, has not yet succeeded in the United States as it has in Europe.

To avoid misapprehension, however, it should be added that all these reasons have recently been losing strength. The public is becoming more and more aware of the need and advantages of a somewhat radical change with regard to all of them.

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Reliable Data on Lot Sizes

One hesitates and is naturally timid in attempting to discuss land subdivision and its effects upon housing, because so little reliable data of any considerable extent exist on the subject. Much laying out of land has been done, but the merit of one scheme as against another has not been tested. To give a basis for conclusions and to guide future action in this matter, the executive committee of the National Conference on City Planning has recently determined to make a systematic compilation of facts and of well-digested opinion in regard to the most effective and satisfactory units of land subdivision for various purposes and under various conditions in American cities. The instructions to this committee are, broadly, to gather and digest any information likely to be of practical assistance to those responsible for maintaining and improving the quality of land subdivision plans. It is the intention to gather the essential facts about the more important types of subdivision plans which have been tested in actual use in the United States, and which have proved their advantages and disadvantages to the developer, to the owners and occupants, and to the general public. An effort will be made to concentrate the study mainly upon a limited number of urban districts, representing large, small, and middle-sized cities, some flat, some hilly, some located in each section of the country. The investigation will seek to discover the physical results, the sociological results, and the financial results of the various types. The more important points outlined for study are: depth of lot, width of lot, width and improvement of streets, alleys, open spaces other than alleys within the blocks, and building or other restrictions.

The first results of this committee's investigation are now available, the local committees from the following

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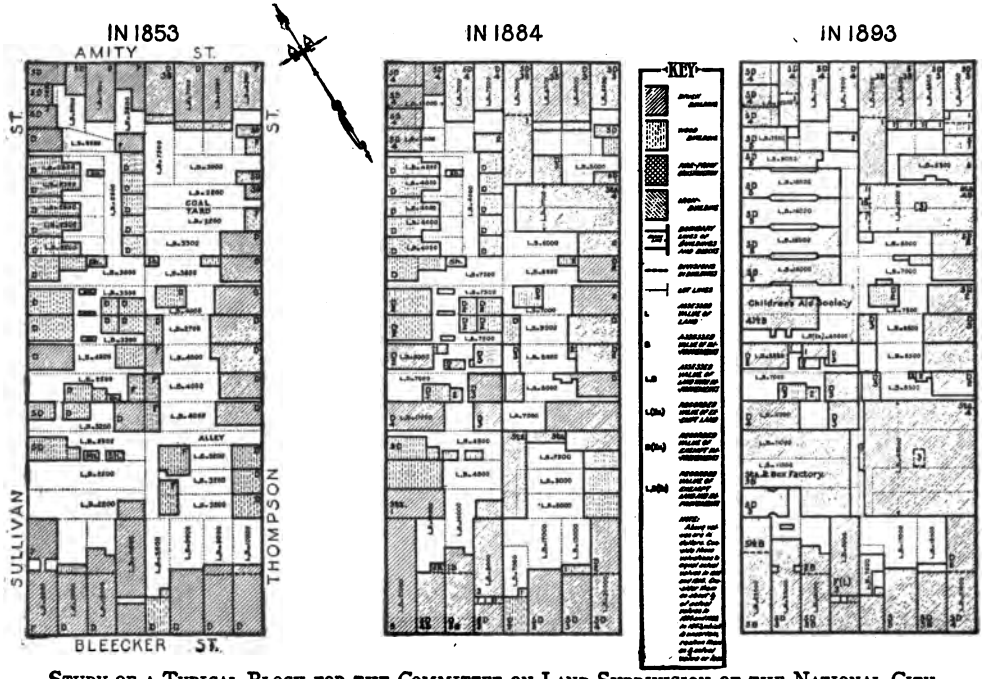

STUDY OF A TYPICAL BLOCK FOR THE COMMITTEE ON LAND SUBDIVISION OF THE NATIONAL CITY PLANNING CONFERENCE FROM AMITY STREET TO BLEECKER STREET, SULLIVAN STREET TO THOMPSON STREET, NEW YORK CITY

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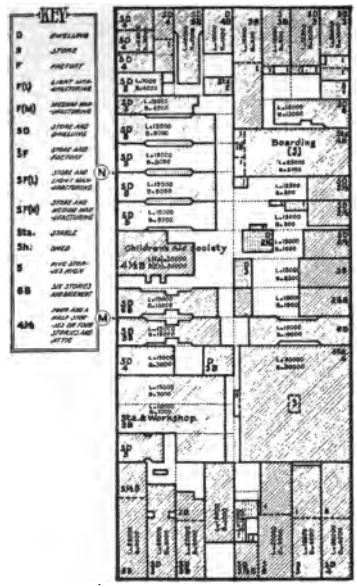

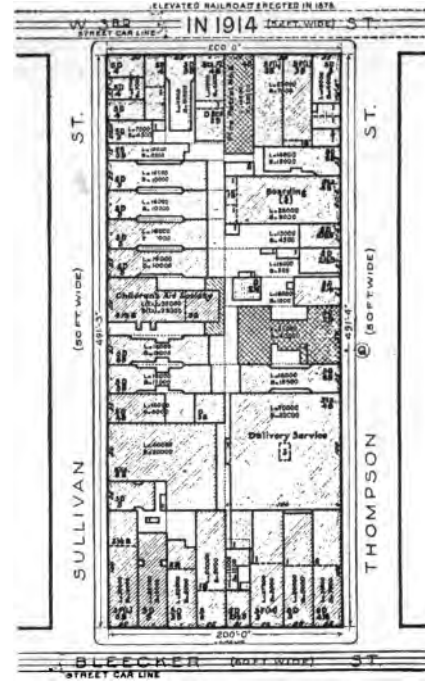

Study of a Typical Block for the Committee on Land Subdivision of the National City Planning Conference from Amity Street to Bleecker Street, Sullivan Street to Thompson Street, New York City

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municipalities having reported: Berkeley, California; Boston, Massachusetts; Bridgeport, Connecticut; Brookline, Massachusetts; Chicago, Illinois; Cleveland, Ohio; Detroit, Michigan; Kansas City, Missouri; Louisville, Kentucky; New York, New York; Newark, New Jersey; Philadelphia, Pennsylvania; Syracuse, New York; Washington, District of Columbia.

The gist of the conclusions deduced by the local reporter, as summarized in the Committee's preliminary report, may be stated as follows:[1]

I. Lot Size

Berkeley.....50 ft. x 159 ft.

Boston.....50 to 80 ft. x 250 to 300 ft. originally.
15 to 25 ft. x 50 to 65 ft. now.

Bridgeport....30, 40 to 50 ft. x 100 ft. (few, 125 ft.).

Brookline....40 to 60 ft. x 90 to 100 ft. (majority).

Chicago.....50 to 80 ft. x 160 to 180 ft. originally.
25 to 75 ft. x 125 ft. now.

Cleveland....40 to 50 ft. x 100 to 150 ft.

Detroit.....50 ft. x 100 to 190 ft.
30 ft. x 100 to 125 ft.

Kansas City..25 ft. x 150 ft., and larger.

Louisville....—— ft. x 200 ft. at first.
—— ft. x 100 ft. of late.

New York....25 ft. x 100 ft. Manhattan, Bronx.
20 ft. x 100 ft. Brooklyn, Queens, Richmond.

Newark.....25 ft. x 100 ft.
Few 20 ft. x 100 ft.

Philadelphia..14 to 16 ft. x 45 to 125 ft. mostly.
19 to 22 ft. x 75 to 105 ft. few.

Syracuse.....200 ft. x 200 ft., 33 to 100 ft. x 100 to 200 ft.
140 ft. x 486 ft., 66 ft. x 132 ft., 40 ft. x 120 ft.

[1] From report presented for the Committee by Mr. E. P. Goodrich, at the meeting of the National Conference on City Planning, Detroit, June 7-9, 1915.

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Mr. L. Veiller[1] 46 cities, —— ft. x 50 to 200 ft.
25 @ more than 125 ft.
9 @ more than 150 ft.

Philadelphia is in a class by itself.....15 ft. x 60 ft. Ave.
New England (Boston, Brookline) is irregular but tending toward .....40 to 60 ft. x 90 to 100 ft.
New York (and Newark).....20 to 25 ft. x 100 ft.
Middle-western and Western cities ——, with later tendencies toward reduction in both dimensions.

II. Lot Size Change Tendencies[2]

Brookline.....90 to 100 ft. large majority.
76 special study majority.
Chicago.....125 ft. standard for depth (for 40 years).
80 and 50 ft. width split.
20 to 30 ft. retained.
Louisville ....Reducing to 100 ft. depth.
New York....100 ft. standard (no change for over 100 years).
Newark.....100 ft. standard.
Philadelphia..Depth tending to shallowest possible.
Syracuse.....128 ft. Ave. of 11 late additions.

General tendency shown toward reduction in depth, except New York (Newark) and Chicago at 100 and 125 ft. respectively, 100- and 40-year standards.

[1] Statements of Mr. Lawrence Veiller, Director of the National Housing Association, based upon returns from 46 cities, presented in full in the *Proceedings of the National Conference on City Planning,* Philadelphia, May, 1911.

[2] To provide for changes in the depth of lots, it would be practicable to lay out lots for residential purposes at double the normal depth plus the width of an extra street, say 50 feet, placing appropriate restrictions on the use of the property to be used later for the street. This would give lots at first, say, 225 feet deep. Later when land became more valuable, the intermediate street could be cut through, and the final lots, 100 feet in depth, established.

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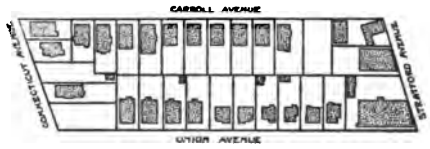

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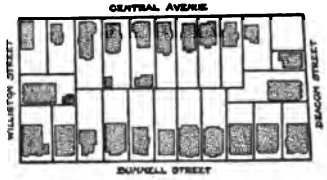

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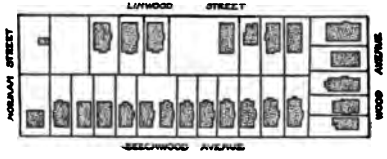

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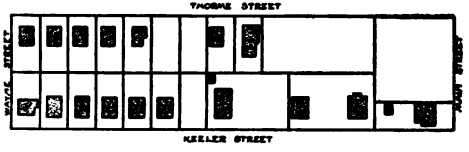

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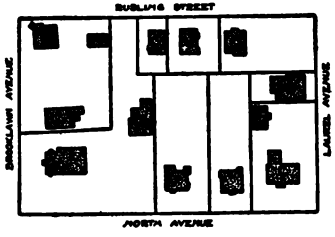

6

Typical Lot and Block Plans and the Building Development of Bridgeport, Conn.
Compare with opposite page. All are drawn to the same scale

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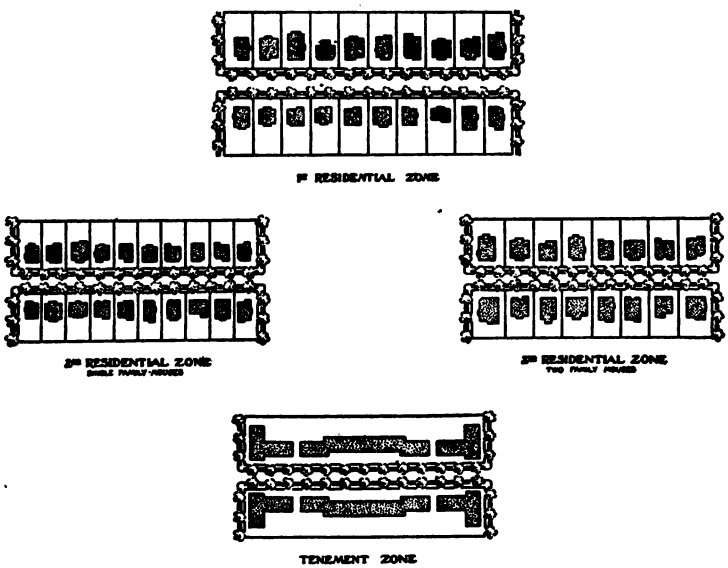
Cities which had lots deeper than 100 ft. tending toward that figure.

New England with its irregular size tending below 100 ft.

Philadelphia tending to smallest possible.

Widths in all places (except Philadelphia) tend down to about 30 ft., while larger and wider than 20 ft. are recommended everywhere.



FOUR TYPICAL BLOCKS IF DEVELOPED IN ACCORDANCE WITH THE RESTRICTIONS RECOMMENDED FOR VARIOUS BUILDING ZONES IN BRIDGEPORT, CONN.

III. Effect of Lot Size on Type of Development

Berkeley.....Lots 150 ft. deep produce rear houses.

Brookline....Lots even 70 to 80 ft. (chiefly above 100 ft.) have had rear buildings erected.

Chicago.....125 ft. depth not economical for poor residential districts.

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80 ft. width too large for general use; even 50's split and redivided; 20-30 ft. lots being retained.

Cleveland.....“Too large” (deep) lots tend to rear buildings with congestion and depression of value.

Kansas City..Good residences use wider than 25 ft.; poorer ones use 25 ft. width.

Louisville....Deep lots lead to narrow ones with dark houses, and badly shaped stores. Narrow lots with rear dwellings are depressed in value.

New York....Less than 100 ft. impracticable for lofts, offices, apartments; also gives bad tenements because no open space in center of block. More than 100 ft. gives narrow bad tenement courts.

Newark.....Lot width tends to determine class of structure. Narrow lots—narrow houses. 100 ft. affords room for rear tenements.

Philadelphia..Single-house tendency has dictated lot size, unfortunately. In conversion to business use, original lot lines usually followed, although often ignored.

Veiller.....Most housing troubles due to deep lots.

Lot area seems to be the original determining factor. Deep lots are made narrow, narrow lots lead to narrow buildings, bad for residence or business. Deep lots even down to 70 to 80 ft. tend toward having rear buildings, often residences. These conditions lead toward congestion with lowered values.

Except in Philadelphia, lot size has generally influenced building size and number per lot. In Philadelphia desire for single-family house has developed small size of lot.

IV. Effect of Lot and Incidental Building Size on Real-Estate Values

Berkeley.....Land values are independent of lot or building class and depend on usableness of property.

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Brookline....Poor occupancy restrains rise in values.

Louisville....Building cheap class of houses detrimental to moral health of community. Shallower lots will stabilize values.

New York...Land values are independent of lot or building class and depend on usableness of property.

Philadelphia..Increased frontage has larger effect than depth. Poor occupancy depresses values.

Washington..Effect of opening up center of a large block for playground purposes has been to eliminate bad class of population.

Where growth is active, either in number of residences or conversion to other uses, the existing lot and building size is of little moment. Where conversion is slower, the larger plots are worth more because more easily converted.

Established poor occupancy tends to depress or at least restrain increase of values through natural depreciation and shift of classes of occupants dependent upon condition of dwelling.

V. Effect of Restrictions on Conditions

Berkeley.....Voluntary restriction works well toward increasing values.

Bridgeport...Lack of restrictions permitted bad housing conditions to grow.

Louisville....Colored problem has dictated restrictions.

New York....Lack of restriction as to per cent of lot area covered has been detrimental.

Newark.....Restricted districts have increased in value; others have not.

Philadelphia..Zoning will materially affect problem.

Legal restrictions as to per cent of lot which may be covered, shape of courts, and locations of buildings on lots, must be added to conditioning lot sizes if best results are to be attained.

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VI. Alleys

Chicago.....Alleys deliberately designed.

Detroit.....Alleys deliberately designed.

Kansas City..In very large blocks, alleys have been used.

Louisville....Large blocks had alleys (sometimes blind). They had poor quality structures erected on them. Modern tendencies are away from use of alleys.

Veiller.....25 cities deliberately designed alleys.

Efforts to make use of waste land in deep lots led to alleys. In some cities they were deliberately designed. Their presence, whether deliberate or evolutionary, is bad as now used.

VII. Standard Dimensions

Berkeley.....100 ft. depth used in ideal rearrangement.

Chicago.....125 ft. depth except in poorer residential sections.

New York....100 ft. best for convertibility.

Newark.....House with proper size and arrangement of rooms should be the basis.

Philadelphia..Desires a standard.

Veiller.....Shallowest possible.
(High-class residence, 125 ft.; middle-class, 50 ft.; poor-class, 25 ft.)

Standards are exceedingly desirable.

A lot depth of 100 to 125 ft. is apparent aim of best standardized conditions and of present tendencies. It is divisible according to Veiller.

In any event, restrictions should be imposed by law.

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The Controlling Purpose of Land Subdivision

What is the controlling purpose of land subdivision in the United States? The question is not "What should it be?" but "What is it?" The controlling purpose of land subdivision is profit, to make money by dividing and, in some cases, improving the land in such a way as to realize the largest possible profit. We do not say that this should not be the controlling purpose, nor that it controls always, or even usually, to a degree open to criticism. We are merely stating a fact that must not be lost sight of. Indeed, the owner or operator who subdivides the land often considers very definitely the effect of the plan upon the purchaser or user of the land, and upon the public, but this consideration is subordinate. His controlling purpose is profit.

A fair question for consideration here is: Should the form and character of land subdivision be determined merely by the will of the land owner, whose main motive is profit? If not, who have claims for consideration, and upon what do such claims rest? Is land different from other things that are bought and sold?

There are really three parties to every land subdivision: the owner or operator; the prospective user, either as owner or tenant; and the public. It would represent a great advance if we could come to look upon these three parties as partners, with certain interests in common in the proper subdivision of land.

Private Property in Land

This is not the occasion for a discussion of the legal or economic aspects of property, but our practice in matters of land takings and taxation, and our repeated statements with regard to the possession or use of property in land,

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show that the law regards it in a different way from other private property. "When the 'sacredness of property' is talked of," wrote John Stuart Mill decades ago, "it should always be remembered, that any such sacredness does not belong in the same degree to landed property. No man made the land. It is the original inheritance of the whole species. Its appropriation is wholly a question of general expediency. When private property in land is not expedient, it is unjust. It is no hardship to anyone, to be excluded from what others have produced: they were not bound to produce it for his use, and he loses nothing by not sharing in what otherwise would not have existed at all. But it is some hardship to be born into the world, and to find all nature's gifts previously engrossed, and no place left for the newcomer. To reconcile people to this, after they have once admitted into their minds the idea that any moral rights belong to them as human beings, it will always be necessary to convince them that the exclusive appropriation is good for mankind on the whole, themselves included."

We have here no quarrel with private ownership in land. On the contrary, there is much to be said in its favor. It fits in and appears to agree with American institutions and characteristics. Our objections, so far as we have any, are with the misuse or uncontrolled ownership of private property in land—a misuse or uncontrolled ownership that very often reacts unfavorably not only upon the user of the property, be he owner or tenant, and upon the public, but also upon the original developer or real-estate operator who continues to own parcels of nearby land.

Regulation and Control of Land Subdivision

The central problem of land subdivision, we believe, is public regulation, control, and restriction.[1] In fairness to

[1] *See* Chap. III.

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all concerned, what should the real-estate operator be allowed to do in this very important matter of dividing up and selling his property, cutting up land upon which people are to dwell for ages to come, changing agricultural acres wholesale into a form from which they can be changed again, if at all, only at great cost?

The principle of restrictions in the subdivision and use of land is well understood in the United States, and very frequently applied. In fact, it is so well understood and so highly valued that it is most often applied in a surprisingly thoroughgoing way by the real-estate operator in his own interest. The restrictions placed upon the purchaser in the conveyance of the property often include a long list of kinds of business which are classified as nuisances, and which may not be established or maintained upon the property; regulation as to stables and garages—fences and walls —set-back of buildings from streets and from lot lines—minimum cost of buildings—easements and rights of way for public utilities, and in some cases the approval of plans and specifications, including nature, shape, kind, height, material, color scheme and location of buildings, and the grading plans of the plot to be built upon. These restrictions or "safeguards" are often placed for a period of twenty-five years or more, with the right of renewal, subject to the assent of the owners. But can we depend entirely upon the knowledge, skill, and motive of the owner or operator to subdivide the land and place the restrictions? At best, his action is uncertain. It is applied only in spots, often spasmodically, and even when most "public-spirited," as we say, it is not always intelligent. Again, his chief motive must be profit. He cannot reasonably be expected to have consistent and permanent concern for the results of his methods upon the future occupants of the property, nor upon the general public. Then, may we not add, he does not always know what is best; and if he did, not owning

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or controlling all the property of the city or town, or even a large percentage of it, he would not be able to make his knowledge effective. Furthermore, he has only the power of a private citizen.

A leading German authority, Professor Reinhard Baumeister, holds that the housing question is primarily a question of land values. "The value of a lot," he says, "is dependent on the revenue from it. If building laws and local usage permit narrow and high buildings, the buyer must pay more, even if he intends to build only a small house. Where the value of a lot is high on account of building laws, the buyer must build compactly or lose money. The density permitted and the value of the lot react on each other." If this view is sound, it follows that the proper regulation of the laying out and occupancy of land can do much to improve housing conditions. Furthermore, many American economists hold that the laborer's minimum outlay for house rent becomes an important factor in determining wages. Therefore, the minimum standard of housing should be a home that meets the requirements of safety, health, convenience, privacy, and that degree of agreeableness which is considered essential. Such minimum standards, we believe, would prove advantageous not only to the workingman and his employer, but, in the long run, to the land-owning class also. The greatest burden of the present system, however, creating automatically, as it does, excessive congestion and slums, falls ultimately on the community. The effects upon the community and the interest of the community in the matter finally, and the community's only alternative, have been well stated by a prominent American business man in the following words: "A willing worker must be able to live, himself and his family, healthfully and comfortably; to bring up his children in good surroundings; to educate them so that they may be truly useful, good citizens; to lay aside enough to provide for himself

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and his wife in their old age. A city which provides less than that, directly, must make up the deficiency in a more costly indirect way. There is no escaping this alternative."

The Need of Technical Skill and Experience

There are, of course, technical problems involved in land subdivision, and their solution requires skill and experience. Furthermore, these problems of land subdivision are related to still wider and more difficult technical problems of city planning, city building, maintenance, and administration, all requiring still greater skill, knowledge, and experience.

Land subdivision, as the term is used by landscape architects and engineers, determines the location and width of streets, roads, alleys, and other open spaces; the location, depth and length of blocks; the location of lot lines, and other physical features. When the subdivision is made upon the initiative of the real-estate operator, and sometimes when it is made upon the initiative of public authority, it determines also building lines, restrictions, and conditions of development. Many examples could readily be given of what is done, and how it is done. Thus it would be seen that land subdivision, determining so many matters in the physical layout of the city, has a very direct and important influence upon housing—perhaps greater and more permanent than any other single influence.

Underlying Principles

Some of the underlying principles of land subdivision generally accepted as sound may be stated as follows:

1. The plan for the subdivision of property should fit the topography, and give due consideration to natural features.

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2. Even if the land is relatively level, the plan should nevertheless have interest, good organization and design. The point of view that leads to a good arrangement on hilly ground gives also a good arrangement on level land. This was illustrated in a measure in the competition for the subdivision of a quarter-section of land carried on by the Chicago City Club. Although the land was described as level, none of the plans awarded the prizes followed the characteristic checkerboard plan which usually prevails on such property in American cities.

3. The use that is to be made of the land should determine its general plan and restrictions. There is no plan that is best for all places, nor for the same place for all time. Merit is largely a question of fitness for its original purpose, and its adaptability for probable future purposes.

4. Thoroughfares, and other broadly related city planning features, should be located first, and within these lines, and in conformity to them, local streets, blocks and lots should be defined in the best possible manner.

5. The various standards for various classes of property, the lot widths and lot depths, the block widths and block depths, recognized by the best authorities, should be applied with skill and discrimination. These are by no means absolute or fixed; they are still open to discussion, and in each case are largely matters of nice judgment. Still, there is some law. For instance, the minimum requirements of detached, of semi-detached, and of row houses in which, for this purpose, there is substantial agreement, determine largely the width and depth of lots; the size of lots determines largely the size of blocks; the blocks determine the layout of the neighborhood. These, in turn, react upon street widths, playgrounds, and other public features.[1]

6. An increase of lots or residence sites by new land

[1] *See* Report of Committee on City Plan Study, National Conference on City Planning, Chicago, May, 1913.

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subdivisions, and of the necessary streets, should be accompanied by a corresponding increase of playgrounds, parks, and other indispensable public features required by the probable population of the area when fully built up.

FISHER HILL, BROOKLINE, MASS.
A residential section safe-guarded by restrictions adopted by property owners

The best time to make these reservations of public spaces is when the land is subdivided. The cost should be assessed in accordance with the benefit.

7. The interests of the real-estate operator, of the prospective owner or user, and of the general public, should be

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harmonized as far as possible. In most cases, this is not so difficult as it might seem. While the immediate interests of the three parties are not identical, they are not in the long run normally in conflict. It is part of the responsibility of the public, acting through well-considered and equitable regulation and law, to remove causes of conflict, and thus to define the rights and duties of the several parties.

8. A plan for dividing land must consider not only immediate use, but also probable subsequent use, administration, and maintenance, and must, so far as possible, forecast and provide for it. This may be done in part by the plan itself, and in part by binding restrictions and conditions, providing for permanency, or it may anticipate a change or conversion into a different use. Opinions of designers differ as to which is more desirable, a plan that makes change difficult or one that makes change easy. Here again it is a mistake to dogmatize. One thing is clear, however, even from a superficial study of land subdivision in its relation to housing, namely, that the worst results have not been due usually to the low standard or the lack of fitness of the subdivision for its original purpose, but to its lack of fitness for the purposes to which there was afterwards an attempt to adapt it, or to the lack of public regulation, or the low standard which the city permitted to be applied. Here, we believe, public regulation and control would be of great benefit. Examples from almost any city in this country may be cited in support of this opinion.

Summary

The conclusions justified by this discussion of the subdivision of land as affected by city planning may be briefly summarized under ten heads:

1. That the main classes of subdivision are industrial, business, and residential.

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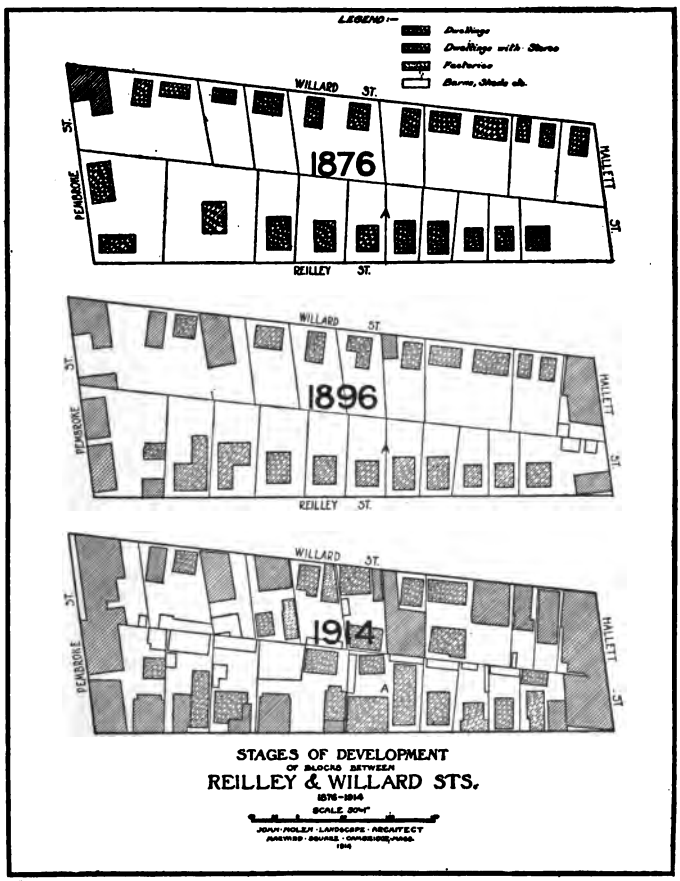
2. That the subdivision of residential property is of most importance, because of its greater extent and its more vital relation to human welfare.



AN ILLUSTRATION FROM BRIDGEPORT, CONN., OF LACK OF PUBLIC REGULATION AND CONTROL

3. That, while city planning can do much to improve housing conditions, there would still remain much beyond

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the field of city planning, upon which good housing would depend.

4. That the investigations of the Committee of the National Conference on City Planning would seem to show that shallow lots, say, 100 feet or less in depth, are most satisfactory as a standard; that the width tends to about 40 feet; that lots 100 feet in depth are readily convertible from residential to business use; that alleys are undesirable; and that wise restrictions upon the use of property tend to increase land values.

5. That land subdivision ought to include a proper consideration of the point of view of the original owner or operator, the prospective user, either as owner or tenant, and the public.

6. That the law regards land in a different way from other private property. So far as possible, speculation in land should be diminished.[1]

7. That the central problem of land subdivision is public regulation, control, and restriction. A safe and sanitary house should be possible for the workingman.

8. That the technical problems in the laying out of land demand more and more the employment of technical skill and experience in their solution.

9. That the underlying principles usually followed in a skillful land subdivision, and generally accepted as sound, should have more publicity and wider application.

10. That the investigation and study of land subdivision in connection with city planning, and the collection of reliable data and well-digested opinion, will bring great benefits—physical, financial, and sociological—in the land subdivision of the future.

[1] *See* Reinhard Baumeister: "Bauordnung und Wohnungsfrage." This is an exceedingly valuable paper.

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CHAPTER III

PUBLIC CONTROL OF PRIVATE REAL ESTATE

Eminent Domain and Police Power

The physical characteristics of a city depend upon the use made of the land within its limits. City planning is the control and guidance of this use. This control and guidance the city exercises in two ways: (1) By taking the land or an interest in it, thus making it public property. (2) By regulating it without taking, thus leaving it wholly in private ownership.

In the construction of its streets, parks, and other public features, the city must have a property interest in the land to be used for that purpose. The land which the city holds is already devoted, as a general thing, to some specific public use. The city in its growth is, therefore, constantly in need of additional land, and must, as a rule, acquire it from private owners.

In so far as the city is able to obtain the land it needs by voluntary agreement with the owner, the acquisition of land for city planning purposes involves no restrictions upon private property rights. In some systems of government this power of obtaining land by private sale is the extent of the city's right. In Vienna, for instance, the city cannot construct a new street or widen an old one, unless the owner of the necessary land is willing to sell it and the city is ready to give the price he asks. But Vienna and other cities so limited in their right to acquire land feel that they are denied powers necessary for their development, and in most cases

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are trying to amend their laws in this respect. In almost all civilized countries, cities already have the power to take land for public use without the consent of the owner.

The right of "condemnation," as involuntary taking is sometimes called, is in all civilized countries coupled with the obligation to make reasonable compensation. Nevertheless, the liability to condemnation is a real restriction upon private property. The owner has often an attachment for his home which the city wants as a site for a schoolhouse; the business man has his own plans for that extra twenty feet near his factory. They do not *want* to sell at a fair price. This public right of condemnation, viewed from the standpoint of a limitation upon private rights, will be the first of the restrictions upon private property to be considered in this chapter.

The planning of the public features of a city is really the smaller part of the city planner's task. The attainment of his complete aim is to put to its best use all the land in the city, whether it is privately or publicly owned.

In the development of its public features, the city greatly affects private property. We have already seen, as one illustration of this among many, how the street system practically determines land subdivision and materially influences the use made by the owner of all privately owned land in the city.[1] In the construction of these public features the city is not legally restricting private rights, but is acting as a private owner of an extensive property might do in similar circumstances. It is the privately laid out street system and other features public in character of Hampstead Gardens, near London, and Forest Hills, in New York, that make these places as a whole much more admirable than the cities of which they are suburbs.

But this influence of public on private development, great as it is, has been found to be insufficient. Cities the world

[1] *See* Chap. II.

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over have become congested, and ordinances limiting the height and area of buildings have been found necessary; they have become confused, and ordinances controlling the location of factories so as not to interfere with residences have become expedient. Thus in direct ways cities are beginning to regulate the use of private land. Regulation of private property is the second class of restriction upon private ownership to be considered in this chapter.

Many people have the feeling that they have or ought to have an absolute right in their own property; and that all such public rights as that of condemnation or regulation are infringements on their proprietorship. No such absolute rights exist at present or ever have existed in any country. The government or "State"—to use the language of jurisprudence—has always exercised a paramount right in the property of its citizens; and today the State may take not only their belongings but their lives if the need is sufficient. This is as true in the United States as in other countries. In the sixties we requisitioned private property and passed conscription laws. Nor are these merely war rights. In time of peril by fire, flood, or earthquake, the State here, as everywhere else, has the same powers; and the reason why less may be taken in ordinary times is that the exercise of this paramount right must, like any other, be in accordance with the need; and in normal times the need is less.

In this country, ever since its foundation, citizens have been guaranteed certain rights regarded as fundamental. These guaranties are often called "Bills of Rights" and are contained in our written constitutions. Neither the United States nor any state can pass a statute, or perform or authorize any act, infringing upon these rights. Under these guaranties the property owner is protected against any condemnation except for a public purpose and upon payment of due compensation.

The idea is rather generally prevalent that it is only here

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in the United States, or peculiarly here, that the individual is protected in his private property rights. This feeling has very little foundation. The principles of law contained in our constitutional guaranties of private property prevail in all civilized countries. In some of them, like England, this protection is not contained in a written constitution, but is based upon the all-sufficient force of public opinion; in some countries, like Germany, this protection is not based upon the action of the courts to the extent it is with us, but more on the knowledge and fairness of administrative bodies. In all foreign countries, too, legislatures are trusted more and courts less than with us. The differences between these countries and ours have been exaggerated, but are material, nevertheless. These differences in the protection afforded private property are not, however, the result of formal differences in legal systems, but of different conceptions of matters of fundamental importance such as, in the field of city planning: first, the question of what constitutes a public use, and, therefore, what are the purposes for which property may be taken; secondly, what is the taking of a property right, and what a mere regulation or adjustment of rights between property owners. These questions are by no means simple, and have given us no little trouble in this country. Illustrations of our difficulties and the differences between the point of view in other countries and ours will appear in the consideration of the specific city planning restrictions on private property later on. The meaning of fundamental conceptions like these varies with the age, with the country, and with the circumstances and conditions in the same age and country. Irrigation, for instance, is a public purpose in a dry western state in this country, but not in an eastern state.[1]

The reason why the state has the power to take land by eminent domain for a public use, and no other, is simple

[1] Lewis: "Eminent Domain," 3d ed., Sec. 308; *Clark* v. *Nash,* 198 U. S. 361 (1905).

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and sensible. The state exists for a purpose—that of serving its citizens. In the taking of property, as in all its other doings, it must act for the purpose for which it exists. Evidently no taking can be for the public unless it is for a purpose useful to the public.

When we come to apply this principle, we encounter difficulties. Is the use of land by the municipality for workingmen's cottages, or for resale in order to keep the price of land, and therefore rents, low, a public use? In Germany, these are public purposes; in this country they are not; for, according to the decisions of our courts, they are businesses into which government should not enter. But a municipality may produce and sell gas or electricity and condemn property for the purpose. Thus theories as to the legitimate field of governmental action enter into the question of the usefulness to the public of a given course of governmental procedure; and it is not strange that the answer in Germany, with its belief that governmental action should have a broad scope, should in many of these questions be different from that of a more individualistic people like ours.

The state is not obliged to take all the rights in a given piece of land necessary for some public use. It may, it is true, take all these rights, and dispose of those which it does not need. It may also take only the necessary rights, leaving the rest vested in the private owner.[1] Thus, in some cities, the entire title to land needed for streets is condemned; in others, the easement of using the land for a street is all that is taken. In the one case the abutter and former owner may be compelled to pay rent to the city if allowed to build vaults under the streets in places not needed for sewers and other public utilities; in the other case, no such rent can be collected, for this is a use of land by the owner.[2]

[1] Lewis: "Eminent Domain," 3d ed., Sec. 448.

[2] *Deshong* v. *City of New York*, 176 N. Y. 475 (1903); Lewis: "Eminent Domain," 3d ed., Sec. 852, p. 1488.

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The distinction between the taking of property which must be paid for, and the regulation of it, which need not be paid for, is also in general outline simple and sensible. It is only in border-line cases, and in cases where theories as to the legitimate sphere of governmental action enter, that difficulties arise.

Government has two functions: the main function of regulating and adjusting the actions and property interests of its inhabitants in their relations one with another and with outsiders, and the incidental function of holding property for the execution of its main function. The United States or an individual state passes and enforces laws against murder, and also owns its capitol building and grounds; a city passes and enforces an ordinance for the disposition by its residents of their garbage, and owns the garbage wagons and the incinerator, with its appurtenant land, for the destruction of that garbage. The distinction between the action of the city in taking private land upon which to build the incinerator and in compelling a resident to use separate receptacles for ashes and garbage is clear. In the one case property is taken; in the other it is not; the first is a case of eminent domain, the second of "police power"—as the power of regulation is called.

But there are cases where the owner of land is deprived of actual rights of profit to him that are, nevertheless, cases of regulation or exercise of the police power. For instance, an owner may be forbidden to rent or occupy a tenement unfit for human occupation, although, but for the prohibition, he could easily rent it at a profit. Evidently the distinction between eminent domain and police power does not rest altogether on what is and what is not a taking of property rights, but also, in many cases, upon theories as to what governments should and should not take without payment. The use of a tenement unfit for occupation is a menace to health; and the preservation of the public health, safety, and

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morals is a sufficient reason for the exercise of police power.

Let us take another illustration. City ordinances are common requiring all houses in certain designated streets to set back a given distance from the street. This is called "establishing a building line." If the streets are wisely chosen and the depth of lawn required is not too great, such an ordinance adds to the comfort and beauty of the street and increases land values. It is constitutional in this country to pass, under the police power, measures designed to promote the public comfort and general prosperity, and appropriate to that purpose.[1] Our courts, however, have decided in building line cases that each landowner is entitled to such damage as he may have suffered over and above his benefits —which generally turn out to be nothing—on the ground that he is deprived of the right to build upon a part of his land.[2] In Germany no compensation is due.[3]

A much-discussed class of cases on the border line between eminent domain and the police power is that of regulations for the improvement of the appearance, or the prevention of the disfigurement, of our cities. Such regulations may well involve the taking of property rights of value. Billboards are often ugly and valuable. But, as we have seen, in some cases there is really a taking under the police power. A nuisance to the nose or the ear is often an instance of such a taking. Such a nuisance is suppressed, although often of value to the owner. Why not a nuisance to the eye? Perhaps for the same reason that an offense to the eye is not legally as yet a nuisance; because it is not

[1] Report of Heights of Buildings Commission, New York City (1913), p. 8, and cases there cited.

[2] Lewis: "Eminent Domain," 3d ed., Sec. 227.

[3] *Prussia:* Baufluchtliniengesetz vom 2 Juli, 1875, ed. by Dr. Walter Saran; *Berlin:* Carl Heymann's Verlag (1911) Sec. 1, 13; *Saxony:* Allgemeines Baugesetz vom 1 July, 1900, 20 Mai, 1904, Sec. 16, ed. by Dr. A. Rumpelt, Leipzig, Rossberg'sche Buchhandlung (1911); *Other German States:* The law is the same.

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sufficiently an offense to the average citizen, or has not been such long enough for him to convince judges and courts of the fact.

Establishment of City Plan

Having finished our consideration of some of the principles underlying all city-planning restriction of private property, let us now take up, step by step, the planning of the city in the light of these principles.

A most essential step in the planning of a city is the establishment of the plan on such a basis of law that it cannot with impunity be violated or departed from. This step should be taken as soon as the plan has been formulated, without waiting for any of it to be carried out. Wise planning anticipates present needs by many years, in order that present construction may conform to and aid proper future development. Wise planning covers the whole city in order that it may be planned as a unit. Present construction executes only such parts of the plan as immediate need demands, and financial ability permits. Even the acquisition to any extent of the land needed in the future seems difficult and often impossible. Thus, the plan is a pattern to be filled in from time to time, and unless at the outset the city has some method of making a general adherence to the entire plan binding upon landowners, it is sure to fail of realization.

Some foreign countries have solved in different degrees this difficult legal problem. In Germany, for instance, after any part of the city plan has been adopted, any person making improvements on his own land within the limits of future streets appearing on the plan, or that part of the plan adopted, is not entitled to damages for the demolition of the improvements; but, on the contrary, if these improvements render street construction more expensive, he must reim-

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burse the city. No compensation is made the landowner for subjecting his land to the city plan.[1]

City builders in this country have felt the importance of establishing the city plan, and have endeavored to do so; but our courts, after some vacillation, have declared that it cannot be done under the police power, and without compensation, as in Germany and other foreign countries, but that compensation must be made.[2]

Evidently, by imposing a plan upon the land of a private owner, he is deprived of rights in his land; but the land in the tract planned cannot become building lots without streets; nor does the planning so much deprive an owner of any right to build as tell him where to build on a tract that must be used partly for streets in any event. Here again our law is more individualistic than foreign law; here, too, we are less trustful of the fairness and ability of city officials. Improper, unfair planning or planning unduly delayed in execution might, indeed, work injustice and loss instead of gain. Nevertheless, the imperative necessity of discovering and introducing a method of establishing a city plan remains a most urgent task for the city planner of today.

Some of the advantages to be gained by means of a city plan made legally binding upon private landowners, we in this country are trying to gain by other methods.

One such method is the provision for an official city plan, binding upon the city and its officers until officially changed. Excellent as this is, it does not protect the plan from the encroachments and attacks of private interests. The records

[1] *Prussia:* Baufluchtliniengesetz, cited above, Sec. 13; *Wurtemberg:* Bauordnung vom 28 Juli, 1910, art. 14, ed. by W. Häffner, Tübingen, A. and S. Weil (1912); *Other German States:* The law is the same.

[2] The law is to this effect everywhere in the United States, where the question has arisen, except in Pennsylvania. Lewis: "Eminent Domain," 3d ed., Sec. 226.

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of the planning departments of many of our cities show how often private improvements have compelled the city to modify or abandon important features of their official plans.

Another method is the provision, now quite common, requiring plans of private streets to be submitted for approval to some city authority before they are accepted by the city as public streets. The authority whose approval is required is usually a person or a body such as the city surveyor, or the city planning commission, supposed to be able to pass upon the streets from the city-planning point of view. Such a law does not in any way limit the legal rights of the landowner or increase those of the city. The owner is still free to lay out streets on his land and sell house lots or build houses on the street as he pleases. The law does not add in any way to the power of the city to reject the street for any reason that seems good to it. The landowner has never had the legal right to compel the city to accept any street as a public street. The object of the statute is to induce the landowner to consult the city before laying out the street, hoping thereby to induce him to lay it out in conformity to the city plan, for fear that otherwise it may be rejected by the city. The trouble is that the landowner is not afraid. All too often, in fact, in spite of the regulation, he lays out his streets as he pleases, and sells lots to innocent purchasers upon which they build their houses, only to find out that it is incumbent upon them to have the streets accepted.

The method outlined above has in practice proved less effective than the foreign method. The city usually finds itself practically unable to refuse to accept streets upon which so much has been spent, and unwilling to allow them to remain under private control. At best, the protection of the city by such a method could only be partial. The city plan may be infringed upon in many other ways than that of speculative housing development. For instance, such legislation does not prevent the building of large factories

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directly across important projected streets, or help to secure to the city a desired site for a public building or a much-needed park.

Excess Condemnation

After making the city plan and protecting it so far as possible from attack by private interests, and before construction of its public features can be begun, land must be acquired for the purpose. We have already seen that land can be condemned only for a public use.[1] It follows that land only in an amount sufficient for that use can be so taken; for only that amount would be useful for that purpose.

Thus, if land outside the physical limits of the principal improvement is taken for purposes claimed to be incidental to and thus a part of it, the question arises whether they are really incidental. The taking of land in this way, in addition to the amount needed for the primary purpose, has been called, somewhat unfortunately, "excess condemnation."

Let us take as an illustration the laying out of a new street and the possible taking of land on each side of it, outside the proposed street lines. For what reasons would the city planner wish to take this extra land? Would such taking be so related to the construction of the street as to be a taking for street use? If so, this land may be taken by eminent domain.

Excess condemnation is most often urged either in case of a new business street cut, or an old one widened, through a low-class development in the center of the city; or of a boulevard in the outskirts through unimproved land. In either case one or more of three effects may be expected:

First, the adjacent land may be raised in value. May not, in this event, the building of the street and the taking

[1] *See* p. 50.

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of the extra land to sell again in order to help pay for the street be regarded as one business enterprise? The courts of this country are inclined to think not. It has been decided that the extra taking and resale are a separate real-estate transaction, and therefore not a taking for a public use.[1]

Secondly, the cutting of the new street may leave remnants of lots on each side of it not large enough for independent improvement, which shut off the land immediately back of them from the street, and prevent the possibility of improvement in connection with the street. If building on the street be delayed until private initiative unites land ownership in these cases, the delay will be a long one. The result will be that the city will lose much in taxes, and the new street, by reason of its ugly appearance for so many years, be given perhaps a character that will permanently impair its usefulness and lower values on it. On this second ground the courts seem inclined to uphold excess condemnation.[2]

A third effect may be that the use of the adjacent land, even if not cut into remnants, may lessen the usefulness of the principal improvement. A boulevard with cheap houses bordering it is no longer the beautiful boulevard that the city spent its money to create; a view which the boulevard was planned to exhibit to those using it may be spoiled by a solid row of tall buildings, or by buildings at wrong points. If the adjacent land were taken wherever necessary and resold with covenants against such uses of it, it would seem as if, without question, the boulevard were improved for the purposes for which it was built.[3] A court decision

[1] Opinion of Justices, 204 Mass. 607 (1910).

[2] Opinion of Justices, 204 Mass. 616 (1910).

[3] This would in some cases be an esthetic gain, but eminent domain, unlike the police power, may be used for such a purpose. *See* p. 61.

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recently rendered holds that taking for such a purpose is not constitutional;[1] but it is too early to decide whether the decision will be generally followed in other states, and by the Supreme Court of the United States. Indeed, the entire law on the subject of excess condemnation in this country must be regarded as still unsettled.[2]

So far, we have been discussing excess condemnation in connection with the construction of highways. It may equally well be used in connection with other public works. The construction of a new public building of any pretension tends to raise the neighboring land values. It is also important, in order that its esthetic effect may not be injured, to control the development of neighboring real estate.[3] Excess condemnation may be useful in the same ways in connection with the laying out of new parks.

We have seen that by excess condemnation the city may take the entire title of land adjacent to an improvement and resell it, retaining only certain rights or easements in it. This is an indirect way of doing what may be done directly. The city may without question take, by making due payment, the easement it needs, leaving all the other rights undisturbed in the original owner. Thus, the city may con-

[1] *Pennsylvania Mutual Life Insurance Co.* v. *Philadelphia,* 242 Penn. State 47 (1913). *See,* however, *Bond* v. *Baltimore,* 116 Md. 683 (1911).

[2] To end these uncertainties, several states have passed constitutional amendments. For references, *see* Shurtleff and Olmsted: "Carrying Out the City Plan," Survey Associates, Inc., New York (1914), p. 278. One of the clauses raising these doubts appears also in the United States Constitution. The Supreme Court of the United States has generally been more liberal in its interpretation of such questions than the state courts. The uncertainty, therefore, still remains in the states which have amended their constitutions.

[3] The best-known examples of such control in the United States are in Boston. *See* Report of Heights of Buildings Commission, New York City (1913), p. 140.

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demn the right to tunnel for subway purposes under real estate;[1] or control the architecture of private buildings near a public building, so that the appearance of the public building may not be injured.[2] The only condition in this, as in all cases of eminent domain, is that the taking be for a public use.

Whatever doubt there may be of the advantage and legality of excess condemnation on other grounds, as a remedy for the disadvantages of remnants there can be none. There has as yet been no complete, honest analysis of the financial results of excess acquisition. There is reason to believe that they are less brilliant than advocates have led us to suppose.[3] In any event, there are other methods of appropriating any unearned gain to neighboring land, such as, for instance, some form of "unearned increment" tax. The easements in neighboring land necessary to protect the principal improvement may, as we have just seen, be obtained by the city by direct condemnation. The evil of the remnant can be cured by excess condemnation alone.

Condemnation for General Public Purpose

In referring to the necessity of condemning property for a public use, we have treated the question as if the use must be one known and stated at the time of the taking. Such seems to be the universal practice in this country. There would be a certain advantage to the city, however, in taking a supply of land in advance, sufficient and suitable for any

[1] Mass. Acts, 1902, Ch. 534, Sec. 6; *Boston* v. *Talbot*, 206 Mass. p. 82 (1910).

[2] See, generally, Report of Heights of Buildings Commission, p. 140.

[3] *See* Mass. House Documents Nos. 288, 1096 (1904); and Herbert S. Swan: "Excess Condemnation," a Report of the Committee on Taxation, New York City, 1915.

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of the public uses of a growing city. The city cannot well decide in advance whether a given tract in a part of the city not yet built will be useful for a school or an engine-house or a small open square; but may well be certain that land for some purpose will be needed, and that it can be selected more advantageously and bought more cheaply in advance. The city also may often shape its planning to suit land that it has thus bought. The land until needed could be rented, often on very long leases, thus paying carrying charges.[1]

Financial Restrictions

The laying out and construction of streets and other public features of the city, and the raising of money to pay for them, are treated in other chapters of this work.[2] The landowner is especially interested in the financial side of these matters. These improvements are partly paid for out of taxation and the proceeds of bond issues. The value of land is materially affected by the tax rate, and the amount of indebtedness of the city, the county, and the state. Usually a part, at least, of the cost of streets and other improvements is charged to the land in its neighborhood, on the ground that this land is especially benefited.[3] This is a matter which differs widely in different states and countries, and is also of vital importance to landowners; but being treated elsewhere, need not be taken up here.

Replanning

In the planning of a city, changes in the parts already planned are sometimes necessary. The most common of

[1] *See* "Carrying Out the City Plan," *op. cit.*, p. 13. The suggestion with regard to renting is that of Hon. J. J. Murphy, Tenement House Commissioner New York City.

[2] *See* Chap. XVII.

[3] *See* Chap. VIII.

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these changes are street widening, the changed use of streets, and the renovation of slums.

A street is usually widened by condemning, by methods already described,[1] a strip of private property on one or both sides of it. This is almost invariably very expensive; for where street widening is necessary, values are likely to be high, and the land already covered with expensive buildings. There is one method of street widening which avoids much of the expense of taking and tearing down buildings —that of the use of the building line, already mentioned in another connection.[2] In order eventually to widen the street, the building line is established back of the façades of the buildings on the street. Thereafter, the owner of a building, any part of which is in front of the building line, may use it as before, but cannot reconstruct, alter, or substantially repair that part of it. He may, however, make minor repairs and changes. This method is in use abroad and to some extent in this country.

The establishment of the building line does not deprive the owner of the building of his title to any part of it, but only of the right to alter, reconstruct, or substantially repair a part of it. This right the city must of course pay for; but the payment will be relatively small, for the land is not as yet taken for city use, and the owner is allowed to get the full use out of the old building. Only when it becomes of little or no value does the city take the part of it in front of the building line, with the strip of land upon which that part stands, paying also any damage done the rest of the building, now of little or no value.

By this method the street is widened at intervals from time to time, as the buildings become valueless. To avoid the irregular line, the city usually allows the owner to erect a temporary structure out to the old line, or, when the old

[1] *See* pp. 47ff.
[2] *See* p 54.

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buildings still remaining are few and of little value, the city at once condemns all that are left, so as to finish the widening at once. This method is common abroad, and is not unknown in this country.[1]

Often there is a change of the use to which a street is put, without any change in its boundaries. These changes sometimes affect private property very greatly, and in such cases it is often difficult to decide whether there has been a taking of a new right, for which payment must be made, or merely the exercise of a right already taken and (in theory and perhaps in fact) paid for, but for the first time exercised. The city has taken title or easement for the use of the land as a street, with all the injuries which that use may do the abutting landowner; so that the question usually is, whether the new use is a street use in the old meaning of the term. For instance, the use of a street for a surface car line is merely another method of using the street for traffic—a well-known street use; but the erection of an elevated structure in it for transit, although a street use, is novel and has been held to be not a use contemplated and paid for when the street was originally laid out.[2] In some cases, theory and fact are so far at variance that statutes have been passed remedying a real injustice. For instance, it is not the taking of any new right from the abutters for the city to lower the grade of a street and leave a house built on the old grade high in the air.[3] For this reason statutes have been passed, and in some cases constitutions of states changed, providing for compensation whenever the abutter was "damaged," "injured," or "injuriously affected."[4] This raises questions

[1] As, for instance, in Philadelphia.

[2] This is perhaps the prevailing doctrine; the cases in the various jurisdictions are, however, in conflict. See Lewis: "Eminent Domain," 3d ed., Sec. 149 and ff., especially Sec. 157 and ff.

[3] *Ibid.*, Sec. 133, and cases cited.

[4] *Ibid.*, Ch. VIII.

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as to what constitutes damage or injury—questions into which we have not space to go.[1]

It would be difficult to give an adequate definition of a slum, or any complete statement of its causes. Certainly the slum usually contains houses either so constructed or in such a state of repair as to be unfit for habitation, or narrow crooked streets and shallow lots, so arranged as to make the area unfit for habitation, or intolerable conditions from both causes combined.

If the trouble is with the state of the houses, the owner may, without compensation, under the police power, be compelled to put them into habitable condition, or leave them vacant. If the fault is in the planning of the area as a whole, the only remedy is for the city to take and pay for the houses and land, throw land and streets into a common mass, and replan, selling the new lots now suitable for building, or, where legal, erecting houses on them itself. This procedure in Europe is sometimes called "zone condemnation."[2] This method may also be used with advantage in cases where a disaster, such as that in San Francisco or Baltimore, has destroyed all improvements over a considerable area, and given a unique opportunity for improving the city plan. Zone condemnation has not been adopted anywhere in the United States, but there would seem to be no doubt as to its constitutionality in many cases, in the name of public health. There are instances in this country

[1] For the law on these subjects, *see* Lewis: "Eminent Domain," Ch. VIII.

[2] Such statutes, varying considerably in principle and method, are found in most European states. The character of the English act (38 and 39 Vict., c. 361, 1875) is indicated by its popular title, "The Unhealthy Areas Act." For Continental, especially German, references, *see* the Saxon "Baugesetz," edited by Rumpelt, Leipzig, (1911); Rossberg'sche Buchhandlung, p. 44, or a less complete list in Eberstadt, Handbuch des Wohnungswesens, 2d ed., Jena, Gustav. Fischer (1910), p. 221.

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of what is practically zone condemnation in the treatment of land made unhealthful by dampness.[1] There is reason to think that our courts would recognize the taking of congested land for replanning as a taking for the benefit of the public health,[2] or that in cases of disaster or congestion there might be a rearrangement of street and private property lines largely or wholly under the police power.[3]

Public Utilities

Hitherto we have considered exclusively city-planning limitations upon real estate and other tangible property. The state is sovereign over all property, including that which is intangible. There is one class of property of the intangible sort which greatly affects city construction and the city plan—the franchises of public service corporations. These franchises are property and belong to the corporations. The

[1] *See* Nolen: "Replanning Small Cities," B. W. Huebsch, New York (1912), p. 177.

[2] "The erection of very tall buildings in cities, especially upon narrow streets, may be carried so far as materially to exclude sunshine, light, and air, and thus affect the public health. . . . These are proper subjects for consideration in determining whether, in a given case, rights of property in the use of land should be interfered with for the public good." *Welch* v. *Swasey*, 193 Mass. 364 at 373 (1907). The case decides in favor of a limitation, under the police power, of the height of buildings. Congestion in other forms may "exclude sunshine, light, and air, and thus affect the public health."

[3] A special law for Frankfort-on-the-Main ("Gesetz betreffend die Umlegung von Grundstücken in Frankfurt a. M. vom 28 Juli, 1902," to be found in the Prussian "Gesetz Sammlung," No. 37; the law is generally known as the "Lex Adickes,") provides for such a rearrangement of property lines. Where an equivalent amount of land cannot be returned to any landowner, compensation in cash may be required. There are more or less similar laws elsewhere. *See* note 2, above.

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stock in these corporations is property belonging to the stockholder. The value of the stock is dependent upon the value and earning power of the franchises. Because of their public importance the public has special need and special power to control these franchises and the actions of the corporations holding them. There are many sorts of public service corporations. The field of operation of some of them is touched upon in other parts of this work. It is only possible to indicate most hastily, by way of illustration, the importance and methods of control of one class—transportation companies.

Transportation is the most important single influence on the city plan. It, more than any other, makes and changes the character of streets and districts, and determines the distribution of population, bringing by its presence and efficiency, distant parts of the city, for all practical purposes, near the center, or, by its lack and inefficiency, keeping nearby parts in effect at a distance from that center. Not only routes, amount, speed, and comfort of service, but rates of fare, make the virtual city plan. A very small proportion of the population of a city can live beyond the range of a five-cent fare. Expensive subways are possible only where there are multiple dwellings, and these soon cause the private houses along their route to be replaced by tenements. In these, and countless ways which are well recognized by city planners and transportation experts and are described elsewhere in this work, transportation builds the city. If uncontrolled, the planning of such construction is done by many irresponsible, conflicting agencies in their own interests. If the public interest is to prevail, the public must regulate and control these agencies.

The public exercises this control in several ways: by regulating these agencies as public utilities; by granting or withholding from them rights in the public streets; by granting or withholding special legislative privileges; by regulat-

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ing them as corporations; and, finally, by itself competing with them or superseding them.

The right and methods of state regulation of public utilities is a complex subject with a long history. The law has always recognized certain occupations as so important to the public that the public has the right to control them. The innkeeper, for instance, must give food and shelter to all at a reasonable price. The common carrier of goods or passengers is also more than an operator for private gain; his occupation is "affected with a public interest." [1]

As a public carrier, the transportation company in the city is not free to earn for its stockholders any dividend it can by charging any fare it is able to collect; it is only entitled to a reasonable return on the money actually invested. Nor is it the judge of what facilities it shall offer. These facilities must in every way be reasonably sufficient. The company and its stockholders are protected, however, by this doctrine of reasonableness, and by constitutional provisions against taking property without compensation; for the making of unreasonable requirements under which the company would not be allowed to earn a fair return is in effect a taking.

Transportation companies must use the public streets, but cannot do so except with public permission. In this way the public may lay out routes and see to it that there is a transportation system according to a proper city plan.

Transportation companies, like all large enterprises, are constantly in need of legislative assistance in the way of new authority. Thus, they may need to take additional property by eminent domain, change their motive power or their routes. The public may then make these favors conditional on extensions and improvements in service.

Transportation enterprises are forced practically to in-

[1] Chief Justice Hale: "De Portibus Maris," cited in *Munn* v. *Illinois*, 94 U. S. 113 (1876), p. 126.

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corporate. There is no legal prohibition in most cases preventing large undertakings from being privately run. The Adams Express Company is one, and perhaps the most, conspicuous example of such an enterprise in the form of a private partnership. There are without doubt many others. Practically, however, in most cases, the amount of capital required is too great. Corporations have always been subject to public control much more than has been the case with individuals.

Finally, the city may itself, wholly or partly, assume the task of the transportation company. If the road is already built, the city may, under its power of eminent domain, take the franchises and property, real and personal, of the transportation company; either running the road itself, or leasing it under stringent operating conditions; or the city may itself build a competing road; or, if the road is not yet built, the city may in the first instance build it,[1] operate it, or lease it for operation afterwards. Nowadays charters are often granted with the condition that the franchises and roadbed become the property of the public after a given number of years, and the rolling stock be taken, if the public authorities so desire, at a fixed figure or a valuation. Often a right of recapture of the road at a figure or a valuation at the end of a much shorter period is inserted. Similar provisions are made in leases when the public owns the road. In these and many other ways there is a recognition of the power of transportation over city planning and construction, and an effort to secure its advantages and cure its abuses.

[1] By assessment of its cost against abutting landowners, as a public highway, if desired. *See* New York Laws (1909), Ch. 498, Sec. 17, adding subsection 3 to section 37 of the Rapid Transit Act; also, "Building of Rapid Transit Lines in New York City by Assessment Upon Property Benefited," a pamphlet issued Oct. 2, 1908, by the City Club of New York in advocacy of this additional section, of which no use has ever been made.

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Building Regulation

We have so far been discussing matters related to the public features of the city. Important as these features are, their sole purpose is to make private land more useful. We have referred to the influence of the public on the private use. We shall now turn to the direct control, by statute and ordinance, of this private use.

More specifically, our subject now is building regulation. This is not a taking of property but a regulation of it, while leaving it in private ownership, for private use. This is done under what we know as the police power, for the public good, without the payment of compensation.

Building regulation seems to have existed since the beginning of civilization and building itself. The regulations of the Middle Ages are well known to us. In outline some of them still survive; but mainly for purposes quite other than those that led to their adoption.

In modern German codes, for instance, there is often a height limitation of five stories, a minimum size of court, and a space required between buildings. In medieval times, these regulations were passed as precautions against fire; today their main purpose is to secure light and air.

Building regulations are of many sorts, passed for many purposes, coöperating, indifferent one to the other, or conflicting. While any mutually exclusive classification of these regulations is impossible, they may be roughly divided into three classes: structural requirements, regulations of bulk, and regulations of use. By structural requirements, as the term is employed here, are meant structural requirements other than those of bulk or use. Structural requirements in this sense may be further divided into regulations to secure stability, and regulations to promote morality, sanitation, or some similar result.

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Building regulations laying down certain requirements to guard against flimsy construction liable to collapse or to be readily burned are very general. Of late years they have become voluminous and detailed. This is partly due to the multitudinous and widely diversified demands made upon the modern architect and builder, and the wealth of materials and processes available to satisfy these demands; partly to the need of setting up definite requirements and standards for use by city officials. This has led at times to the undue curbing of the freedom of the builder and the architect, who, in their inventiveness, but for these special requirements, might well have found cheaper and better methods and materials. It is to be feared, also, that special interests have often succeeded, to their own profit, in securing the exclusive adoption of their own materials and processes. Whatever the reason for these detailed requirements, it seems to be generally admitted that construction in many of our cities has been made unduly expensive by them.

The desire to secure stability, combined with the bureaucratic tendency toward formal uniformity, has led to another unfortunate result. The requirements for all buildings have been made too much the same. The differences between a theater, for instance, and a dwelling-house are too obvious to be overlooked. Not so with the differences, hardly less real and important, between the large and the small house. As a result, it is scarcely too much to say that the differences, seen and provided for in the one case, have been overlooked altogether too much in the other, so that much the same requirements have been made for the cheap house and the dear, the single house and the multiple dwelling. This is not equality, but most unfair discrimination. The small building does not need so thick walls, for instance, as the larger one. The relative expense of the same walls is much greater for the cheaper than for the dearer

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one. This evil, while it exists in this country, is much greater in Germany.

Structural regulations, passed ostensibly to obtain stability and nothing else, sometimes have social and economic results quite as important. Thus the requirement that tenement houses in New York City over six stories in height should be fireproof,[1] by greatly increasing the expense of building higher tenement houses, has greatly lessened the number of higher ones to be built.[2]

[1] Originally Laws 1901, Ch. 334, Sec. 11; now Tenement House Law, Laws 1909, Ch. 99, Sec. 15; renumbered, Laws 1913, Ch. 551, Sec. 14. *See also* same, Sec. 24, as amended, Laws 1913, Ch. 551.

[2] Housing conditions in New York are unique; in applying experience there to other places this must not be forgotten. Nevertheless, this experience judiciously used may be of great value everywhere. Housing evils have been greater in New York, and have developed earlier, than elsewhere in this country. This has made New York in many ways a pioneer. A comparison of conditions there twenty years ago and today shows that probably in no other city in the world has there been in this period progress in tenement house conditions so rapid or so great. The construction of the infamous "dumb bell," on a narrow lot, with its many dark, unventilated rooms, has stopped; in place of the air-shaft, the tenement of today has light and ventilation for every room not on the street, from comparatively wide and ample courts and yards. Every apartment has, in the apartment itself, its toilet, and practically every one, its bath. There has been no loss of life due to conflagration in any of the tenements erected under the "new law," passed in 1901.

Yet the unparalleled increase in the requirements made, in the public interest, in these twenty years, of the tenement house builder and owner, has apparently caused little if any rise in rents. Hon. John J. Murphy, Tenement House Commissioner, in an unpublished address delivered before the American Association for the Advancement of Science, at Cleveland, January 3, 1913, says: "It is not true that there has been any great increase in tenement house rent—also, notwithstanding the high cost of living, and the increase in taxation, rentals are today much lower than they were before the panic of 1907. In fact, they are only slightly higher than in 1902."

Nor apparently have the law of 1901 and its amendments been any check on the steady and rapid increase in the building of new

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There are also structural requirements (other than those of bulk or use of buildings, to be dealt with later) whose object is to promote morality, sanitation, and the like. The specifications with regard to plumbing, water supply for every family, and perhaps a separate water closet, are examples of this class of requirements, so common in modern building, housing, and tenement house codes and laws.

The main purpose of regulations limiting the bulk of buildings is to guard against undue concentration in cities. A certain measure of concentration is necessary. The division of labor, upon which modern civilization is so largely dependent, has differentiated the land of the country into urban and rural land. In the rural parts of the country, the raw products are produced and extracted; in the city the product is manufactured and exchanged. Manufacture and exchange require, much more than production and extraction, those close and quick contacts which only the intensive use of land can give.

But undue concentration defeats the purpose of concentration; it becomes congestion, clogging movement instead of quickening it. For the first time in history this problem is

tenement houses. In round numbers, a billion of dollars has been invested in the 24,000 "new law" tenement houses, in which a million and a half of people live. The map in this report shows graphically the number and location of these tenements in the borough of Manhattan.

For a fuller summary of these facts, *see* the following articles by Commissioner Murphy: "Tenement House Reform Since 1890," soon to be printed; "Some Effects of Housing Regulation," in *The Annals of the American Academy of Political and Social Science,* Jan., 1914, vol. 51, p. 99. *See also* "The Tenement House Problem," edited by De Forest and Veiller, Macmillan Co., New York (1903), 2 vols.; "Housing Reform in New York City, Being the Report of the Tenement House Committee of the Charity Organization Society of the City of New York for 1911, 1912, and 1913" (pamphlet); and the reports of the Tenement House Department of the City.

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acute. Cities have always existed, but never before have they been so numerous or so large. Machinery and improved methods in manufacture, in the arts, and in agriculture, have increased the product, lessened the number of people required for production, and augmented the number necessary for supervision and exchange.

At the same time our demands upon city life have changed. Streets built for the occupants and business of moderate structures are lined with much greater buildings; central areas are crowded with the people and affairs of wide new areas, brought near by improved transit.

Nor is this all; the problem is also one of living conditions. In olden days overcrowding, bad air, lack of light and sun were accepted as an inevitable part of city construction; by most people they were not even known to be evils. Under these conditions cities grew. Now, with increased knowledge of cause and effect, we demand light and air in our cities as necessities of life. To satisfy these requirements we must have space. This, as never before, brings the problem of concentration home to cities the world over.

The usual provisions regulating the bulk of buildings are those limiting height and area. The purpose of height limitations is to prevent a building from intercepting too much light and air from its own lower portions, and from neighboring buildings. The purpose of area limitations is to secure on each building lot a minimum of open space for the access of light and air to the building and to neighboring buildings; and, if possible, space for outdoor life. The purpose of both classes of provisions is to prevent undue concentration with relation to streets, public open spaces, and public utilities. They apply, of course, only to new buildings; they are not retroactive.[1]

Height is limited sometimes at a fixed maximum, some-

[1] For the practice in California, however, see p. 82.

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times with relation to the width of the street upon which the building stands.

Area limitations usually either require a percentage of the building lot to be kept open; or prescribe courts and yards of minimum dimensions in given localities with relation to the building; or make both classes of requirements. The percentage requirement leaves to the architect greater freedom in the planning of his building. It is more often regarded as sufficient where the required percentage is large, and it is easier to give each room its light and air. The purpose of the prescribed courts and yards is to make sure that each room has this light and air, so far as possible.

Sometimes bulk regulations are framed combining height and area limitations, as, for instance, regulations requiring a larger percentage of open space, or larger minimum courts and yards, the higher a building is built. Evidently, to secure the same access of light and air, there must be more open space in connection with a tall than with a low building.

Bulk regulations may be the same for all buildings in a given city or district, or vary with the class of building. It is usual in Europe, and not uncommon in this country, to fix a height limit which no building shall exceed.[1] It is also usual, there and here, to recognize that special buildings should be specially regulated as to height; such as factories, where a large number of persons are employed, and tenements, where large numbers live. This variation in regulation is also based on the use to which the building is to be put. Other use regulations are those requiring special exits for theaters, special fire escapes for tenements, etc.

[1] Report of Heights of Buildings Commission, New York (1913), pp. 4, 23.

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Districting

So far, we have treated building regulations as if in any given municipality they were the same for all buildings, or for all buildings of the same class. This may be the case. Regulations, however, may differ in different parts of the municipality. Such regulations are called district regulations.

Districting may be by bulk or by use. By varying the size of buildings in proportion to the lots they occupy, we may obtain degrees of concentration in our districts; by varying the grouping of buildings according to the use for which they are intended, we may give the districts unity and character.

Districting according to bulk developed in Germany, the country where districting originated, as a remedy for congestion. City planners there in the seventies found the centers of population almost hopelessly overcrowded; and saw with alarm that this condition was spreading as cities grew. In the older parts it was impossible, without virtual confiscation, to require new buildings to be much lower or smaller than those already there;[1] for the price of the land had adjusted itself to the development. As practical men, they therefore left the rules in the centers much as they were, and secured the enactment of adequate restrictions for the newer parts of cities. This created districts varying one from the other in the height and area of their buildings. Experience has shown that this is the only way, conservatively and wisely, to prevent the spread of congestion in cities as they grow.

Districting according to use was devised in Germany as a

[1] Quære: whether, after concentration has reached a certain point, as perhaps in lower New York City, this would be true? *See* Report of Heights of Buildings Commission, New York City (1913), p. 104.

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remedy for confusion in cities. Under the first Napoleon, protected districts were established for cities in parts of what is now South Germany. Within these protected districts the construction of buildings for the more offensive, dangerous and unhealthy manufacturing was not permitted. This system spread, and became Prussian and, later, imperial German law.[1] From this system developed districting according to use, in the many forms and degrees in which it exists in Germany today.

In the typical German city we find a system combining districting by bulk and districting by use. Let us take Frankfort on the Main as an illustration—a city where the system is comparatively simple.

The old or inner city is the first zone. Here the highest buildings are allowed, and the greatest proportion of the lot may be covered. Factories are permitted, but are not numerous. The inner city existed long before districting was adopted.

The outer city is divided into an inner, an outer, and a rural zone, in which the permissible height of new buildings and percentage of the lot that they may cover progressively decrease. In each of these zones are residential, industrial and mixed sections. In the residential sections factories are so discouraged as to be practically forbidden. In the industrial sections every industrial facility is furnished; and residences, since 1912, are forbidden. In the mixed sections, situated near the industrial sections, certain less offensive industries are permitted. Some of the remoter parts of the city are reserved for country houses. Through all the zones and districts run the main traffic streets, where shops and minor industries are permitted, and buildings somewhat

[1] Gewerbeordnung für das Deutsche Reich, vom 21 Juni, 1869, in der Fassung der Reichsgesetze vom 26 Juli, 1897, und 30 Juni, 1900; Sec. 16 to 27. *See also,* Wörterbuch des Deutschen Staats und Verhaltungsrechts (Tübungen, 1913, Vol. 2, p 248.)

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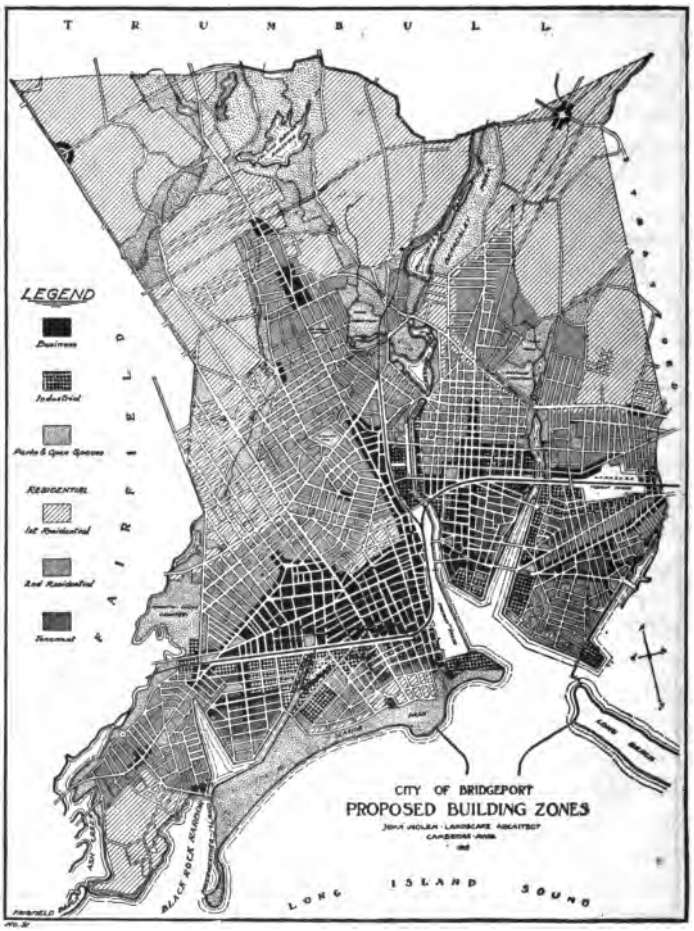

higher, and covering a somewhat greater proportion of their lot, than buildings on other streets in these zones and districts, are allowed.

The object of districting is twofold: first, to discover differences in different parts of cities and adapt regulations to

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them, where these differences are desirable, or, as is so often the case in the built-up sections, too deeply fixed to be changed; secondly, to protect, accentuate, or create character in a district.

All cities have within their limits localities of distinct and

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different character. New York, for instance, has its financial and office district downtown in the narrowest part of the Island of Manhattan. There land is most valuable, buildings tallest, and streets narrowest. Quite different in character is Fifth Avenue; different again are the Bronx, Brooklyn, and the remoter parts of Staten Island. These differences are in each locality expressed in the height, density, and form of building and in land values. Each is a district of the great city, with conditions and character of its own.

So Boston has its State Street, its Back Bay, its West Roxbury. So Chicago, New Orleans, San Francisco, cities everywhere, even down to those of but a few thousand population, have differences within their boundaries and express them in character of buildings and variations in land value.

Regulation, to be effective, must adapt itself to these differences. If rules were uniform they would require buildings of the same height on Wall Street and Staten Island, New York, State Street and West Roxbury, Boston, city centers and city suburbs everywhere.

The district system also seeks to preserve desirable differences. The intrusion of a factory into an expensive residential district is a menace to the health and comfort of its inhabitants and the value of land in the district. Nor is it only the residences of the wealthy that should be protected. Humbler homes should be kept free from disagreeable and unhealthful smoke and noise.

Districts, too, may often be given a character. In recognizing the importance of natural characteristics, we sometimes forget the importance of acquired ones. A regulation assuring to a district an exclusively residential character is often enough to make it a desirable residential neighborhood.

Districting properly carried out does not interfere with

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the neighborhood center, but should recognize it, just as greater centers are recognized. Nor need the neighborhood diversities and relationships, less concentrated than at the neighborhood center, be sacrificed. For instance, the main traffic streets in residential districts are, from a business point of view, good locations for the minor industries that must be near the residences, but should not be scattered among them; workingmen's residential districts should be near the industrial districts where the men work; and residential and industrial districts in some cases may consist of single streets, adjoining and parallel.[1]

The aim of the districting system is, therefore, to put all land in a city to its highest use, and preserve it for that use until it becomes better suited to some other use. The result of the system should be to increase land values, and prevent fluctuations in them. Experience in Germany would seem to show that this is, in fact, its result.[2]

The districting, or zone, system, was first evolved and advocated in the seventies by Baumeister, one of Germany's great theoretical city planners; first applied in 1884, and more fully in 1891, by one of her great city administrators, Dr. Franz Adickes; has stood the test of thirty years, and is today the established system in Germany, the country where city administration has reached its highest efficiency.

From Germany, the system has spread to Switzerland, and the Scandinavian countries. England has borrowed from it somewhat in her planning act of 1909. Canada and the United States, at first perhaps unconsciously, but now deliberately, are beginning to adopt its principles.

The best-known instances of districting by bulk in the United States, are the height districts in Boston, and in

[1] *See* Frank Backus Williams: "The Street as the Basis for Districting," *The American City*, Dec., 1913, p. 517.

[2] Report of Heights of Buildings Commission, New York City (1913), pp. 102, 112.

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Washington, D. C. Many states in this country and provinces in Canada have authorized districting by use and a number of their cities have acted under this authority. Districting in America has usually taken the form of the establishment of residential districts, within which certain industries may not be introduced. Generally, industries of

ZONE OR DISTRICT MAP OF GREATER BERLIN

Figures represent stories; districts of two-story buildings, detached buildings; districts of three-story buildings all in solid rows, except the lighter parts of Ndr. Schönhausen and Hohen Schönhausen; districts of four and five stories, all in solid rows.

these classes, if already in the district, may remain. California alone in some instances has expelled them.[1]

There is reason to think that districting under the police power, without compensation, is constitutional in the United States.[2]

[1] Report of Heights of Buildings Commission, New York City (1913), p. 32.

[2] *Ibid.*, p. 7; *Cusack Co.* v. *Chicago*, 267, Ill. 344 (1915).

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An interesting form of districting by use is provided for in the New York State housing law for second-class cities, passed in 1913.[1] It authorizes the common council, on petition of two-thirds of the owners affected, to establish residential districts. The unit of area for a district is that of the lots fronting on one side of a street, between two intersecting streets. This is districting partly by local option. It has been decided (*Eubank* v. *Richmond*, 222 U. S. 137, 1912) that to leave the matter wholly to less than all those interested would be unconstitutional as a taking of property without any sufficient guaranty that their decision would be in the public interest.

Districting partly by local option is no doubt good as a first step. But such a system does not lend itself to the adoption of any consistent and complete district planning. It is most important not only that districts should be rightly located themselves, but that they should be located for the advantage of other districts. Most workingmen's residences, for instance, must be near industrial districts.

The Board of Estimate of New York City has recently obtained authority to divide the city into bulk and use districts, and a commission is now proceeding with the work. The result will be of great interest.

Unity in Planning

One thing more of great importance remains to be said of the planning of the public features, and the controlling of the use of the private land of a city: both must be done as parts of one city plan. The street in width and character, the park in extent, the subway in capacity, must each be fixed with relation to the bulk, character, and location of buildings, and the number of inhabitants, for common use in one city.

[1] Ch. 774. Now repealed.

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Effect of Planning on Land Values

This completes the long list of city planning restrictions. That they are an advantage to the community as a whole, this chapter perhaps has already succeeded in proving. But, in spite of being imposed upon private property, they serve the interests of that property and, indeed, are essential to its value.

In the aggregate, land value is very largely a community product. This is true of all kinds of land. The fertility of agricultural lands is due to the goodness of God and increased by the industry of the individual owner; but the value of it consists almost entirely in its accessibility and the intelligent honest government of the community in which it is situated. In Central Africa and in much of Mexico at present, there is a large quantity of very rich land that would be dear at the price of a very poor song. How much more true is this everywhere of building land values. Even in the United States, with its intelligence, stability and growing density of population, where aggregate front foot values compare very favorably with aggregate acreage values, the extent of agricultural land vastly exceeds that of building land. Only a small part of the exceptional value of building lots is anywhere due to a God-given harbor or an individually filled or piled lot; increase in population, a more or less honest government, a more or less intelligent community development, have done the rest.

Very few of us realize the fact that city land development in all but the exceptional case, is the work of the community. The city lays out the streets, licenses the public service corporations, chooses their locations, decides where the parks and public buildings shall be, and, except where it is left to private interests or chance, determines by districting the character of neighboring buildings. Nothing remains

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to the average individual but to accept the character that has been given to his land and build accordingly.

The exceptional case is that of the large real-estate owner developing virgin territory for high-class suburban residential use. He can plan his tract and to some extent fix its character by private restrictions in deeds. But this he can do only in America and such other countries as still neglect the duty of making public plans in all such cases. The large individual owner cannot plan the streets and other public features of his tract in the best way and, therefore, in the way most advantageous to him, because he cannot control their relation to those which may be planned for adjacent lands; that can be done only by a plan made by the city for the city as a whole. Nor can he fix the character of his tract, as the city can, by a districting plan for the entire city. How often—to take as an illustration one class of cases out of a great many—lack of proper restriction in surrounding territory injures the restricted tract. Then, too, the restrictions, if for a short term of years, soon run out; and if for a long term or perpetual, in many cases become unsuitable and obsolete. The landowner, having exercised his power at the outset, has exhausted it; the city may be given a flexible, continuing power, and is thus very much better fitted for the task.

Increase in land values is an indissoluble part of community development. The landowner, great or small, will find his interest and the general interest one and the same. To help himself he must, in common with all citizens, throw himself into community life and make it honest and efficient.

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CHAPTER IV

LOCAL AND MINOR STREETS

The main purpose of this chapter will be to deal with certain general principles that apply with especial force to the treatment of local streets,[1] and, above all, to make a plea for the exercise of a much greater degree of discrimination in the design and construction of such streets than has heretofore been the practice of many of those engaged in this work. In order, however, to make somewhat clearer the general statements that will be submitted, some of the views expressed will be illustrated by giving a few typical examples of rules of practice that have been followed with satisfactory results for nearly twenty years in the development work with which the writer is associated.

It may tend to simplify the question under consideration, if, before taking up its discussion, we first remind ourselves of our reasons for laying out and opening streets of any kind, and recall the character of the various items of cost involved in such work. To state the matter in a very elementary way:

(1) The only function performed by a street, which could not be as well, and more cheaply, provided for in

[1] In the discussion, herein presented, of the question forming the subject of this chapter, the term "local street" is employed to indicate a residence street designed to serve strictly local needs only—as opposed to streets destined to be thoroughfares. If streets having more than a purely local use were under consideration, the conclusions offered would obviously be considerably modified.

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other ways, is that of furnishing means of circulation—in the form of either through or local travel.

(2) Two items enter into the cost of every street—land cost and construction cost. To these, where heavy grading is done, there is often added a third item, consisting of injury to abutting property caused by deep cuts and fills.

The chief mistakes made in the treatment of purely local streets have commonly arisen, in the writer's opinion, from a failure to discriminate, with sufficient sharpness, between the traffic, in respect of both its character and its volume, to which local streets are subjected, and that which thoroughfares are called upon to accommodate. The result has been a failure properly to discriminate between the necessary requirements of the two. Purely local streets are made unnecessarily broad—which results in a waste of valuable land. Without regard to topographical conditions, such streets are laid down in straight lines, and then, in order to secure easy gradients, heavy cuts and fills are made; such practice not only adds greatly to the cost of grading, but it inflicts sometimes great and usually unnecessary injury to abutting property. Monotony and dreariness in the general aspect of the streets must also inevitably follow the execution of a plan that lacks evidence of a proper sense of discrimination or fitness. Thus, not only are the opening and construction of streets made unnecessarily expensive, but the street plan as a whole is deprived of the attractiveness and interest that arise from variety in plan and from the evidence, where such is shown, of an intelligent adaptation of means to ends.

Manifestly, mistakes of this character in the treatment of local streets can be avoided only by keeping in mind both the character and the limited volume of the travel that such streets will be called upon to accommodate.

Main thoroughfares, as is everywhere recognized, must be broad and direct, and they must have easy gradients.

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These are usually expensive requirements, but, where possible, they must be fully met, whatever the cost or the damage to abutting property. The local street has none of these requirements, and while the writer has seen many illustrations of the expense and damage resulting from the practice of laying out local streets unnecessarily straight, unnecessarily broad, and with gradients needlessly easy, he does not recall having ever observed a case where the opposite rule of practice, intelligently applied, has resulted disadvantageously.

Width of Streets

The local street need not be broad, and to make it so incurs needless expense for grading and paving, as well as for land taken; moreover, if made of a width sufficient only for its use, it acquires thereby a quality more distinctively domestic—it is "cozier" and more attractive. There are many successful instances where, in recognition of special conditions, streets have been laid out 40 feet, or less, in width. Such streets illustrate very markedly the wisdom of freely departing from conventional ideas as to the minimum allowable width of a street. In the writer's opinion, however, a good width for the typical local street, in a neighborhood of the better sort, is 50 feet over-all, of which 23 feet may be devoted to driveway, leaving about 13 feet on each side for footway and planting. This 13-foot space between the curb and the property line will allow for a paved walk 3½ to 4½ feet wide, a space of 2½ feet between the walk and the lot line, and from 6 to 7 feet between the walk and curb for trees and other planting.

In allowing only 23 feet for driveway, it is assumed that the gutters will be shallow, the depth consisting practically of that secured by continuing the ordinary crown of the road to the curb, so that the entire width between curbs can

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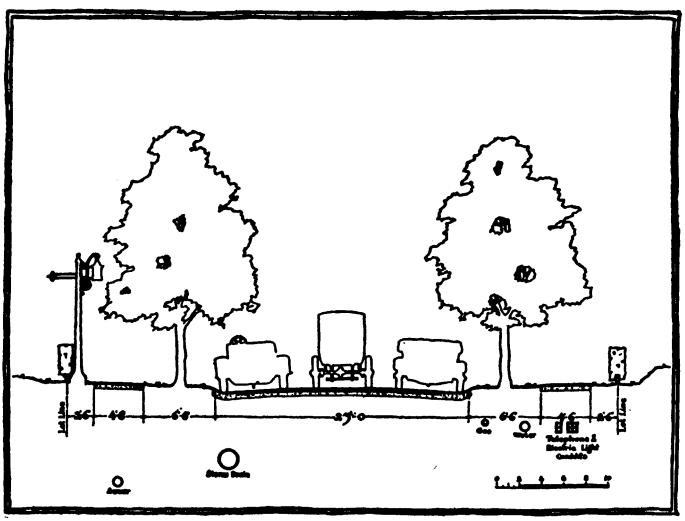
be used as driving space. Where gutters are constructed too deep to be readily utilized as part of the driving space, the width between the curbs should be correspondingly increased. A typical street of this width, with subdivisions of the total space as above indicated, is shown by the accompanying illustration.



A Typical Fifty-foot Street, Showing Arrangement of Driveway, Sidewalks and Planting Spaces
Roland Park—Guilford District, Baltimore

It will be apparent that the spaces allowed respectively for driveway, walks, and planting spaces are reasonably ample for these purposes. If more space for planting is desired, the street may with reason be made wider for that purpose; but on a purely local street to devote more space for driveway or walks than that shown in the illustration is worse than merely wasteful; the result produced is less satisfactory even in point of appearance.

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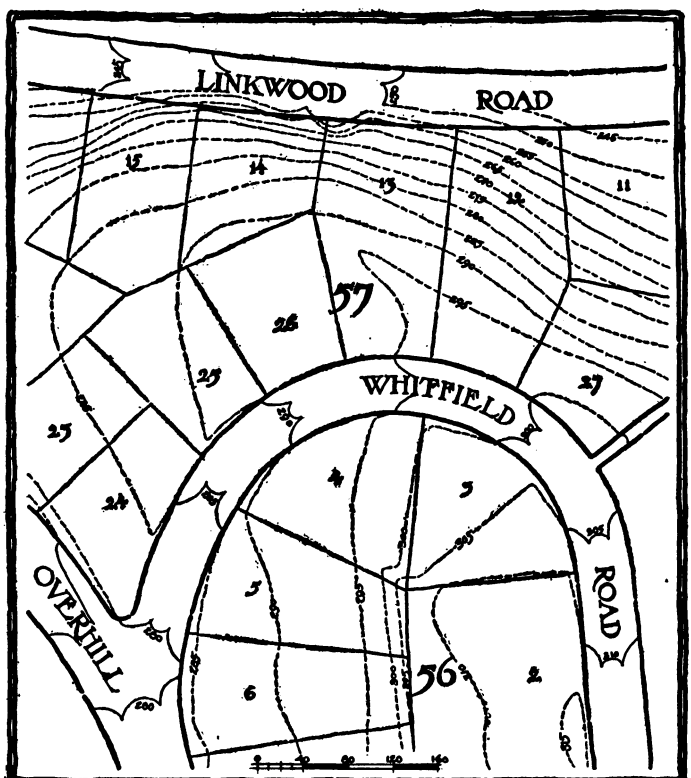
Alignment

To open a street on perfectly straight lines, or even on lines slightly curvilinear, will often result, not only in high



A Street Sharply Curved to Meet Local Topographical Conditions
Roland Park—Guilford District, Baltimore

grading cost, but in injury to abutting lands, both of which can be largely avoided if it is realized that it makes but little

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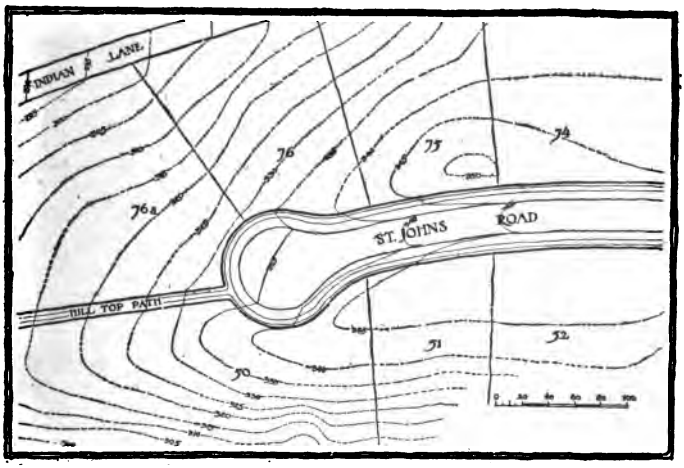
difference how sharply curved the local street may be, so long as its alignment is such as to present pleasing perspectives and, at the same time, enable such street sensibly and reasonably to meet the purely local need for which it is intended. Local streets may, therefore, be allowed to follow the natural contours of the ground to a much greater extent than is commonly done. Offsets, also, in straight streets



A Street Laid Out Along the Crest of a Ridge
Roland Park—Guilford District, Baltimore

may frequently be desirable, either with the practical object of meeting some local condition, or for the purpose of interrupting a street vista that might otherwise tend to monotony, and of affording, at the same time, the opportunity to place at the termination of such vista an interesting building or other architectural feature. The fact that lack of directness in a street tends to protect it from through travel is, moreover, of positive advantage to a purely residential street, and it must be borne in mind that a street so laid out will be protected not only from ordinary through

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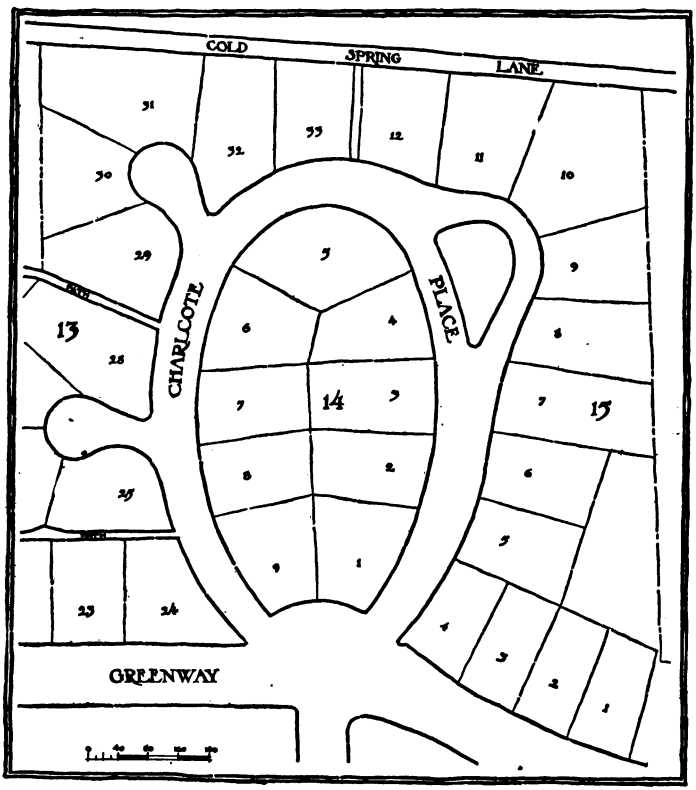
traffic, but from car tracks, so often unwisely laid on streets other than thoroughfares.

If we continue to keep in mind the limited requirements



CHARCOTTE PLACE
Roland Park—Guilford District, Baltimore

of a purely local street, it will appear, also, that, in many places where topographic or other conditions make it difficult or undesirable to extend a street to its intersection with another, such streets may be designated with "dead ends,"

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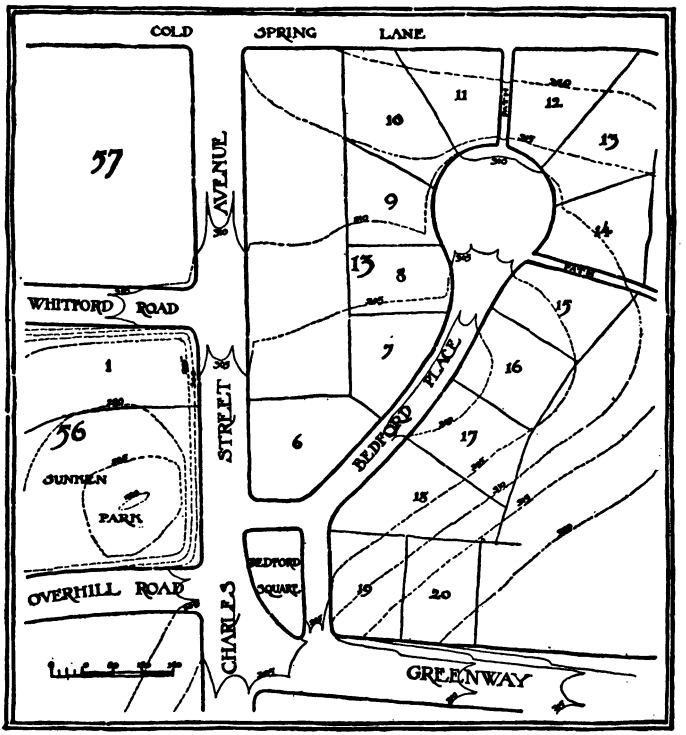
or returned upon themselves, forming "places," to which great charm is attached by the sense of privacy and seclusion which they impart. The accompanying cuts give illustra-



BEDFORD PLACE
Roland Park—Guilford District, Baltimore

tions of streets thus "dead ended," or "places" formed by this method of treatment.

It must be stated, however, that in every case here illustrated the form and location given the street have corresponded with topographic or other surrounding conditions that constituted a problem for which this plan offered the

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best, or at least an adequate, solution, and it must be urged with great emphasis that such justification must always exist for interference to the extent here indicated with the circulation afforded by streets that connect with each other in the usual manner. Otherwise, such a treatment will be merely freakish, and will be lacking in sanity and reasonableness.

Relation of Local Streets to Thoroughfares

While, wherever possible, reasonably convenient communication with neighboring thoroughfares must be provided, the highly desirable object of preserving the local street from the invasion of through traffic will often require that this communication should not be too direct, or at least too obvious, and in cases where the tendency of traffic might be, to some extent, to choose the local street instead of an equally convenient thoroughfare, it will sometimes be desirable deliberately to make the communication between the thoroughfare and the local street sufficiently indirect, or uninviting to through traffic, to prevent such tendency.

Gradients

In the same way that directness is a necessity of a thoroughfare but not of a local street, so it is with easy gradients, and there can be little question of the unwisdom of incurring high grading costs and injuring abutting land by making heavy cuts and fills for the purpose of securing gradients on local streets easier than those demanded by the requirements of the limited travel that such streets will be called upon to accommodate.

The question is one, the solution of which manifestly depends, in every case, upon local conditions. Proper con-

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sideration of the injurious effect of heavy cuts or fills upon abutting property, as well as of the expense involved thereby, will frequently make it appear advisable to accept gradients as steep as 15 per cent, and sometimes, for short distances, grades exceeding 15 per cent will be unhesitatingly adopted. Even on local streets, however, it is undesirable that gradients as steep as 15 per cent should extend for a distance of more than 400 or 500 feet.

A Convertible Plan

Our previous discussion has had in mind streets so located that there could be little or no probability of any future change in their character or use. The designer of a street plan, however, will frequently have to consider streets that will at first fall distinctly within the category of "local streets," and, humanly speaking, will never be needed as main thoroughfares, but which are so located that at some future time it may be necessary to use them as minor thoroughfares. Such a street should be designed with a view to such possible conversion. In addition to modifications in alignment and gradients that such consideration will obviously impose, a street of this character must also be given a greater width than is required by a local street, and an arrangement of driveway, planting spaces and sidewalks ought to be adopted that will have in view the possibility of such a conversion at a minimum of cost and of disarrangement of plan. This may consist of a plan that provides for a narrow driveway, no wider than will be needed while the street preserves its local character, and for throwing the space supplied by the extra width of street into that portion of the planting space that lies between the curb and the paved sidewalk. The street trees and the paved sidewalks are placed relatively near the property lines, in the same lo-

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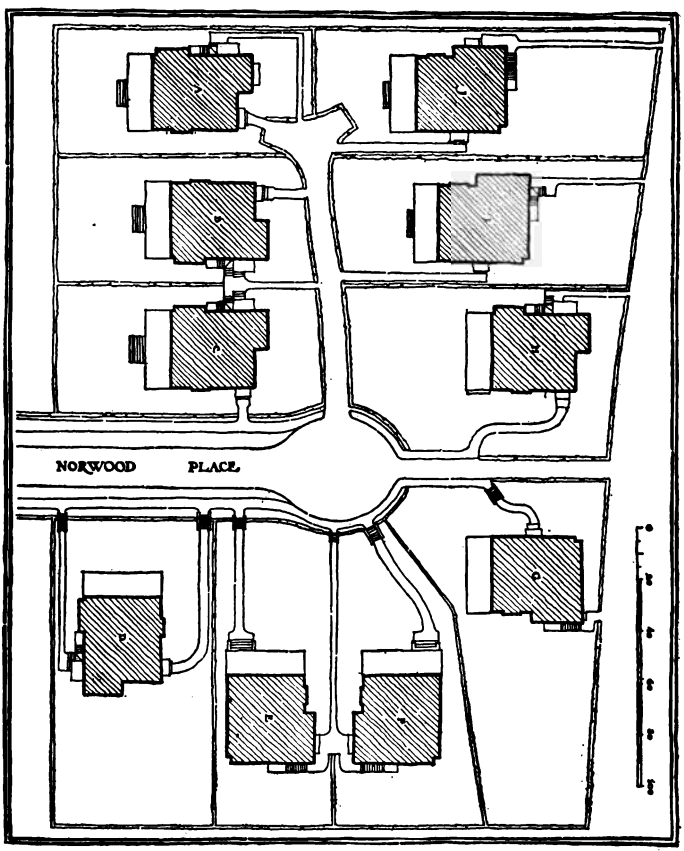
cations that would have been adopted for them if it had been intended to construct a wide driveway in the beginning.



NORWOOD PLACE
Roland Park—Guilford District, Baltimore

Such a plan reduces to a minimum the difficulties of a subsequent widening of the driveway.

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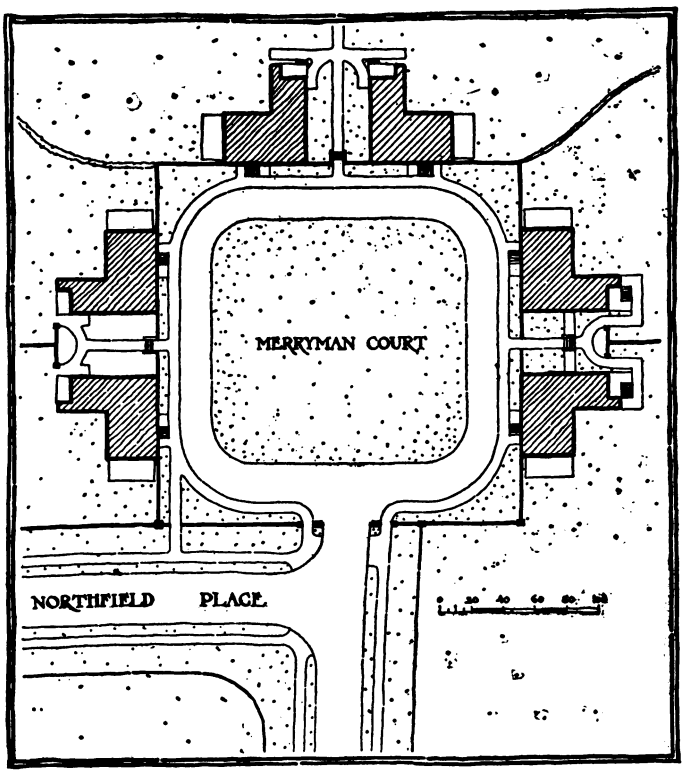
The Importance of Not Laying Out Local Streets Too Far in Advance

The exact locations of the local streets are of no importance to the general street plan. It would be wise, therefore,



Merryman Court
Roland Park—Guilford District, Baltimore

to delay fixing their location, alignment, gradients, etc., as long as possible, in order to be able to take note of changing conditions that might affect questions of design.

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There is generally a tendency, however, for the thoroughfares of a city to be built on in advance of any considerable demand for the laying out and opening of adjacent local streets. When such a tendency becomes apparent in any locality, it should be taken as a warning by the public officials charged with the responsibility for the street design, that the time has come to locate and establish the lines of the necessary connecting local streets, in order that the erection of buildings in locations proper for such local streets may not interfere with, or make more expensive, their subsequent opening. The opening also of purely local streets in one location will often make it necessary to establish the future locations of connecting streets on adjacent land earlier than might otherwise be necessary.

Such considerations will modify the otherwise desirable practice of postponing the establishment of the lines of local streets until it is intended actually to open and construct them.

Types of Pavement

The question of the type of pavement to be adopted in any given case is not, of course, as important as other questions involved in the treatment of local streets, since if mistakes are made in this particular they can subsequently be corrected without great cost. The same general principle, however, of the adaptation of means to end must be kept in mind, and, under present conditions of travel, usually leads to the adoption of some form either of bituminous macadam or of concrete with a bituminous surface, both because such pavements are comparatively noiseless and much less dusty than others, and because in most localities they are on the whole the most economical. An abundant and cheap supply of a good quality of gravel may in some localities indicate this as a material that may be advantageously used for sur-

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facing local streets; and the necessities, where they exist, of reducing initial cost, will, of course, always impose their own rule of action in regard to types of paving, as well as to other items of street construction.

The Distribution of the Cost of Opening and Improving Local Streets

These costs should be laid wholly upon the nearby property—almost entirely upon that actually abutting on such streets. This policy recognizes the purely local character, in respect both of benefit and use, of such streets, and gives emphasis to the reasonableness of the view that in location, in design, and in methods of construction, the interests of the abutting property should be the dominating if not the sole consideration.

The prices at which developed land must be sold depend a good deal upon the cost of development; if what has been said in support of the plea that the local street be laid out solely with a view to its meeting local needs has shown that the cost, in land and construction, of a street so designed will be materially less than if designed also to meet other needs and conditions, it would appear reasonable to suppose that the general adoption of these methods would be an aid in the solution of the problem of supplying cheaper land for small and inexpensive houses.

Building Lines

A brief reference is included in this chapter to the subject of building lines on abutting property, for the reason that the question is connected, though indirectly, with that of street widths. A building restriction requiring buildings to be set back a certain distance from the street, has for its

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main purposes: (1) to secure privacy to the occupants of the buildings from passers-by on the street, and (2) to make more agreeable the appearance of the street as a whole by (a) imparting a general air of spaciousness and (b) increasing the amount of visible greenery. A local street requires less "set-back" to secure reasonable privacy than does a thoroughfare. It will, however, be apparent that if, as is herein urged, the width of the local street be much reduced, there will be a rather greater need for set-back restrictions in order to assure the preservation of a reasonable distance between houses on opposite sides of the street.

In concluding this discussion of the treatment of local streets, it may be added, by way of reminder, that the extent to which any general rule of practice may be carried must always remain a question of judgment, to be exercised in each individual case. The main object of the writer has been to lay emphasis upon the consideration that should be given to the practical questions involved without their solution being influenced by conventional ideas as to alignment, widths, and gradients, often followed without regard to individual requirements; to urge, in fact, the simple theory that the treatment of every local street is a strictly local problem, and ought to be dealt with as such.

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CHAPTER V

PUBLIC BUILDINGS AND QUASI-PUBLIC BUILDINGS

A city in its material expression cannot well be considered apart from its public buildings, because its active life is so closely bound up with them. Conversely, the subject of public buildings cannot be treated without reference to that of the city. Great distinction is given to a city by public buildings; its significance, however, is extremely variable both in its nature and in its quality.

The government centers in some capital cities have a predominance so great, both as to the extent of the buildings themselves and as to the public ground forming their setting, that they may be fairly considered as special cases. Of such centers in Europe, Moscow and Buda Pesth are striking examples. Equally striking examples on this continent are the cities of Washington, D. C., and Ottawa, the capital of Canada.

The government buildings in all these cities are combined with their natural sites to great advantage, and they largely control the effect of the cities themselves. In the case of the European examples, at least, they dominate them to the exclusion of everything else. It is true, also, of the latter that they represent conditions of greater permanence than with us, owing to an inherent sense in the public mind of the primary importance of government as distinguished from private buildings.

The significance of a group of public buildings unsupported by striking natural features of the ground may be

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also very great in a city. The Place de la Concorde in Paris, with its surrounding buildings and those of the Tuileries, is an example, and it is certainly the finest in the world. Again, it may be a question of the controlling effect of a single building, such as the Palais de Justice at Brussels. Thus we have a wide range to consider; all the way from the dominant masses of buildings referred to above down to a single striking unit.

It is of first importance to provide the necessary area for expansion of public buildings to meet growth and its requirements, and of equal importance so to plan such an area that the greatest advantage may be taken of it, both as to economy and as to the effect of the buildings and the grounds themselves.

Lack of foresight in acquiring sufficient area means unnecessarily great expenditures in the future. The lack of planning means also waste, in the sense that the work carried out has too often to be replaced, being not only inadequate, but so distributed as to require its removal for improvements of a proper nature. In other words, the work involved in the placing of a group is never done until it is done properly. The demand for orderly and beautiful surroundings and for economy in arrangement is growing daily in this country. One generation owes it to the next to establish conditions of relative permanence, and if the next is to share to any extent the cost of carrying out a scheme, then it is incumbent on the forerunning generation to provide a scheme which will be of fine quality and adequate to the future needs.

To the subject in hand properly belongs the consideration of national government buildings, of state capitol buildings, and of municipal and quasi-public buildings which are bound up naturally with the life of a city. Having regard, however, to the limitations of space, consideration will be given chiefly to municipal buildings and such buildings as

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PLACE DE LA CONCORDE, PARIS

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belong with them or may be grouped with them to advantage. To national government and state capitol buildings the principles to be stated later on, as governing the composition of municipal groups, may be said to apply equally.

Public buildings may be truly said to be the representation in ideal form of community ideals; they should typify its permanence, and should be "what the Acropolis was to Athens or the Forum to Rome and Saint Marks Square was to Venice, the free embodiment of civic life." That these ideals exist in the public mind, though too often ill expressed, is evidenced by the tendency to the use of the styles of architecture that most properly may be termed of classic or universal character. This tendency is responsible today for the striking anomaly of one- and two-story public buildings, contrasted with surrounding great commercial structures, a tendency, however, which will require only time for proper adjustment. This adjustment will come with the recognition that the essential in composition is that there be architectural style, rather than a particular style.

In this chapter, however, the discussion involves primarily the relations of public buildings to the streets and the general composition of the city, rather than the specific qualities of the buildings themselves.

Location of Public Buildings

First in importance is the location of public buildings with regard to the city as a whole. They may be grouped in one center or they may be grouped in various centers, according to the plan of the city. They are rightly placed when grouped in locations that will satisfy economic conditions, and when they are readily accessible to the public.

As the chief factor in this question is that of the growth of a city, it may be stated as a first principle that the location of

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public groups should be chosen with reference to the expansion of the city. Municipal buildings, municipal courts, halls of record, etc., naturally find a place adjacent to or in the heart of the business district. Customs houses and post-offices belong naturally with the railway or waterway terminals or at other transportation centers. The law courts in general may find a location together with public libraries, auditoriums, and other buildings of a similar nature on the fringe of a business district, if not within the residential district—in any case, somewhat aloof from the turmoil of the downtown center.

Happily, the general character of the buildings of the various groups suggested is readily adjusted to the surrounding conditions in each case; it demands simply that the program of requirements be followed in their design. Thus, the municipal building may be made to harmonize readily with the buildings of the business district, a case well illustrated by the New York Municipal Building, the City Hall of Chicago and the City Hall of Oakland, Cal. Thus, also, the post-office or customs building harmonizes in expression with the architecture of the wholesale and light industry districts, a case which is illustrated by the federal buildings in Boston and in San Francisco. Finally, the law courts may be readily harmonized with the less densely built districts, or such districts as may be controlled in their architectural expression with regard to height limitation. Its more monumental architecture, also, may so find dominance in its expression. The examples cited of the municipal buildings may truly be said to be exceptional, owing to the size of the cities they represent. The statement, however, in a general way will be found to be true of cities of a more moderate size.

It may be remarked here that transportation by rail and water, although bearing a strong relation to such buildings as post-offices and other federal buildings, has little or no

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GRAND PLACE AND HÔTEL DE VILLE, ANTWERP

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influence on the location of the buildings constituting the other groups. Accessibility to the whole city, however, in their case is of the greatest importance.

As before stated, the location of public buildings is bound up with the general structure of the city. This means that it is bound up directly with the street system, and the systems of transportation as governed by the street system. While the groups may be advantageously placed on prominent streets in a rectangular system or composed with principal intersections in the system of streets, yet for the more important groups the ideal location is that at a focus of many streets.

Such a point in the city plan will give the maximum opportunities of accessibility from all directions; also, the maximum opportunity for architectural effect of the public buildings and for their development with regard to the streets themselves, and with regard to the plazas composed by their intersections. A focus of this nature may be inland, or it may have reference to a river or lake front, the latter being perhaps the finest of all.

There is an economic advantage in the concentration of transportation lines and arteries of circulation towards one or more focal points. It is possible, also, by the concentration of sites of buildings in one or more general locations, to combine the otherwise scattered and ineffective pieces of land, which must, in any case, be used as a setting for individual buildings, into a space which not only will be useful for circulation of traffic at the center proposed, but will give a more ample setting to the buildings so placed.

Again, the buildings themselves may be so related by harmonious design that they will create an effect which cannot be accomplished in the case of a single or isolated building. With one or two, or possibly three, centers established in the city, an administrative center, an educational center, an art center, a transportation and mailing center, or

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various combinations of any two of these elements, a plan may be evolved which, without attempting to mass all public or semi-public buildings in one spot, will have the advantage of reasonable concentration, a plan that will be of public benefit and will wield the influence so paramount in these days of orderly and harmonious arrangement.

It is unnecessary, however, to enlarge upon the questions of desirability of the grouping of public buildings. The practice is recognized as absolute in the old world, and it is fast reaching recognition in this country as evidenced by the numerous plans of this nature now being prepared for the cities here. The greater number of the large cities are proposing in one way or another to create a civic center or group of public buildings.

The approaches to civic groups must be carefully studied, and every attention given to the relation of the buildings to the vistas from the streets. Markers should control these vistas. The composition or arrangement of the buildings themselves is vital; normality of the dominant building to governing natural lines or to main axial lines should be strictly observed.

In general, it may be said that these groups should be placed naturally; that they must be in a scale and proportion harmonious with the city, and be integral parts of it; that they are never so fine as when properly placed as to the natural surroundings, and when the architecture is contrasted with appropriate foliage. Also there must be a subordination of the masses to some one dominant note, or a fine general equality in the element of the composition.

The Sites of Public Buildings

It has been the common practice in this country to place a public building in the center of a square of ground, allow-

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PIAZZA DEL PLEBISCITO, NAPLES

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ing a more or less ample setting for the building. As a rule, such a square is surrounded by public thoroughfares of approximately equal frontage value, and of growing importance—streets which become, as time goes on, built up with a heterogeneous collection of private business blocks. Into these buildings, or others still less conveniently located, the public offices usually expand with the growing needs of the various departments for increased space. Otherwise, additions are made to the public building, in most cases symmetrical in its plan, with very bad results. Ultimately the public building may be rebuilt. In most cases it then occupies to its limit the available space in the square. Beyond this limit the expansion of the building or buildings is difficult, if not impossible, owing to the fact that the surrounding streets separate the public square from adjacent property, and that the property values themselves are high.

Another common practice is to select a site on a principal thoroughfare. The site of a public building under such conditions is open to most of the objections brought against the public square. It has no reasonable means of expansion. The building becomes an obstruction to the continuity of business occupancy, and other sites for public buildings or for the accommodation of departments of city government, no longer available in the original building, have to be selected in other parts of the city.

These plans are obviously bad, both in the sense that they are uneconomic, and in that the results achieved are not worth while. A well-selected site allows for expansion of the building or group of buildings in one or more directions. This condition can only be realized by the selection of the site after a careful study of a city's existing structure, of its street lay-out, and of its tendencies and rate of growth. The site must be such that it will not lie in the immediate path of the expansion of business, or, if so, that it will be sufficiently removed in point of view of distance to make its

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interference negligible. To accomplish this the street plan of existing cities may sometimes have to be modified.

If the program be a limited one, requiring a moderate area, a site occupying the whole of one side of a square—economic conditions being right—is good. The building or buildings, if they be simple as to their mass and regular in design, may at least control the square and give it a monumental quality. The Boston Public Library on Copley Square, the City Hall of Antwerp, situated on the Grand Place, and the Piazza del Plebiscito in Naples are examples of this arrangement. An expansion of the buildings can be made with reasonable facility, by extending the site in the rear and leaving the chief frontage undisturbed.

Again, a site on a thoroughfare is not necessarily bad. If economic conditions are met—that is to say, business is not obstructed—and the building program is sufficiently extensive, very interesting architectural results may be had. The group should take the form of a succession of similar or related units. The minor spaces between them will be controlled by their architecture, and the opposing frontage of private structures, even if not controlled as to their architecture, will be at least dominated by the regularity of the lines and unity of composition of the public buildings. An interesting example of this exists in the public buildings, art museum, etc., of the city of Liverpool, lining one side of a thoroughfare.

It is true that this example adds to its advantages, in part, an open frontage on the square. It is of interest to call attention to St. George's Hall fronting on this square, although practically within it, as an example of the dominance of one single unit of monumental design with buildings of a heterogeneous nature on at least two of its sides. The example of Liverpool, presenting many phases of the problem, as viewed from various standpoints, is of value in connection with the study of American cities, the conditions of

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which are so similar, owing to an early lack of appreciation of the value of perfect order. This example, irregular as it may be, and presenting two distinct compositions, although blackened by the smoke of an industrial and business center, has, nevertheless, a certain charm and magnificence.

The group plan surrounding or controlling a public space may be said to be the ideal plan. Arguments need not be presented to demonstrate the quality that may be attained in the composition of a group of buildings of a balanced nature on a regular axis, and with a dominant central note. Buildings thus placed naturally complement one another, and, although the problem of design is one of great complexity, in that it deals with various units, the opportunity of fine results is consequently greatly enhanced. By acquiring sufficient area in the proper location, such a plan may be carried out in one or more centers.

The above considerations are of great weight at the present time. Building operations in this country have become of a more permanent character, and design is greatly improved. The growth of cities and the public necessities are being given study, and the basis exists for a reasonable forecast of future conditions; also, improved building regulations and the regulations for the control of height and frontage are being considered. Under these circumstances, the matter of contrast of public and private buildings will become less acute, and conditions of an ideal nature may be brought about.

The city of Detroit may be cited as one among many examples, in embryo, of the grouping of buildings as outlined above. The system of streets may be said to relate to three centers—the center of administration, of transportation, and of art and letters. Transportation will be centered around a union station now completed. In front a fine plaza is proposed, and from it will start a new diagonal street carried across the city to the center of arts and letters. Atten-

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tion has been focused on this center of arts and letters, which is to be created on Woodward Avenue. Twenty-nine acres of land, including streets, have been acquired, fronting on both sides of the avenue—on the one hand for the library, already built, and on the other for the art museum and subsidiary buildings. The City Hall is located in the heart of the business center, and the courts are on its fringe.

The city of Minneapolis is an excellent example. Here, also, the centers are subdivided—that of transportation being practically permanent as at present located. A complete scheme for the grouping of the civic buildings has been designed in anticipation of the growth of the city and of the business center. It should include administrative buildings, law courts, auditorium, public library, etc. The Court House, however, is adequate for the present needs of both the law courts and the offices of the city administration. The separation of the law courts and their reconstruction at the new center are proposed in the future, thus allowing the present building to be used for the administrative offices alone, in close conjunction to the business center.

The center of transportation is at the meeting of the main thoroughfares at the river, the natural focus of both railways and traction lines. One section of a union station has been built by the Northern Pacific road; legislation has been obtained enabling the city to construct the remainder, and to compel other railroads to enter the station.

An art center has also been started by the building of a portion of an art museum. The site is ample for a most complete art school and museum; and adjacent sites are available for other buildings.

The municipal center proposed and herewith presented, illustrates the principles of composition already outlined, both with regard to its location, its control of a complete public square, and its future expansion.

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WATERLOO PLACE, LONDON

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Relative Nature and Design of Buildings

In thinking of the interesting plazas or public groups abroad, both in the smaller cities and in the larger ones, the mind is filled with impressions of the limitless number of charming examples in which the dominant note is a religious building. It is not the purpose, however, to discuss this phase of the question, but simply to note the similarity between the church and low public buildings in their changing relations to the city. Although at times forming the dominant note through a composition or an accidental effect, it can rarely compete with the height or mass of modern structures. It should, therefore, conform rather to the general spirit of the architecture of the day, and gain distinction by fineness and simplicity of form.

Formerly public buildings may fairly be said to have represented the height of achievement of constructive science, as well as of artistic expression. In this they were rivaled only by the church and were often excelled by it. Such conditions existed in this country until the advent of skeleton steel construction. A great impulse to the building of tall structures was then given, and, with the natural clinging to old or recognized monumental types of buildings, anomalous conditions were created. The public building, like the church, has been submerged by the flood of business blocks. Excess and pretension in the expression of a great portion of these commercial structures, for the most part uncontrolled, have added to this condition.

Under the influence of economic pressure and perhaps, also, of the daily impressions on the public mind of the magnificent and compelling, though accidental, effects in the grouping of the commercial blocks, a reaction is being brought about.

At this time certain types of public buildings are rivaling in proportions the greatest of commercial structures. Of

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these, the most striking examples have already been mentioned. They are largely the resultant of considerations of economy, of the value of the site. The problem involved in these buildings is similar in nature to that of everyday business life.

A natural selection is in process with regard to our public buildings. While certain of them, of an office building nature, demanding the ordinary accommodations of an office building, are being absorbed into the mass of the commercial downtown district, others are still obeying in their expression the tendency to more formal and architectural lines, controlled in their architectural expression by the program of their requirements and the function of the building. The latter are preferably located on the fringe of business, but, it is to be admitted, must sometimes be placed in the very center.

Herein lies the interesting comparison of the two categories of public buildings; those which cannot vie in vertical mass with commercial buildings and must, by reason of their function, find distinction by strength of design in contrast to their surroundings, and those which may vie with their surroundings, and seek to attain distinction by domination of outline. It is fair to say that the opportunities for preponderance of effect along sound lines of composition are very great for our public buildings in the future, both within and without our great business centers—opportunities of similarity and contrast.

In both these cases the question of control of private buildings, both as to height and design, comes very largely into play and is strongly to be urged, especially where buildings are all merged on a level plane and there are no advantages to be gained by topographical conditions.

A composition of buildings about a public square has been described as the ideal plan. The ideal public building within a city center is one which satisfies the economic ne-

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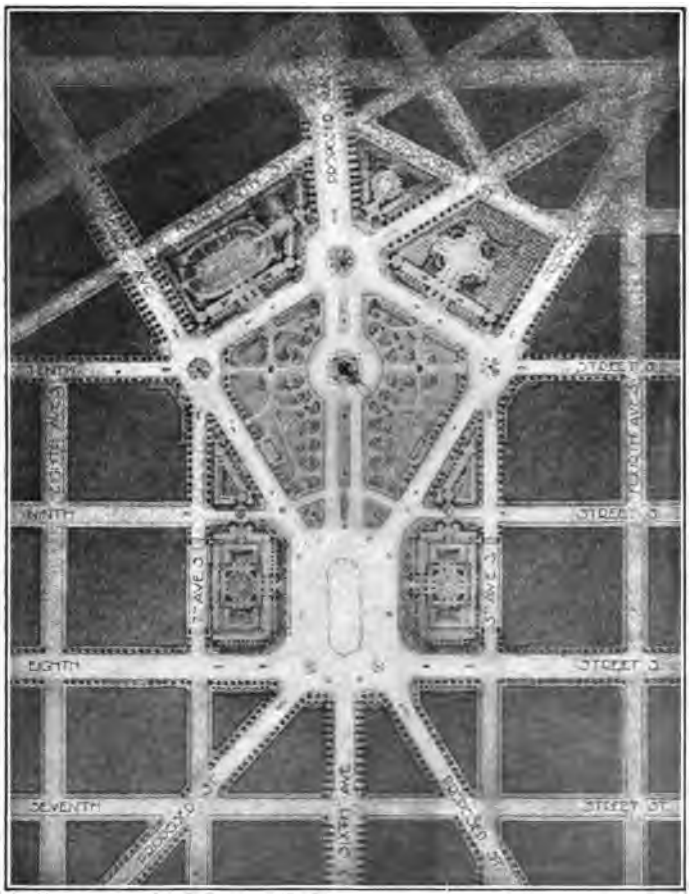

PLAN OF THE PROPOSED CIVIC CENTER, EMBODYING LAW COURTS, AUDITORIUM, PUBLIC LIBRARY, ETC., MINNEAPOLIS

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cessities and, while clearly expressing its function, yet dominates its surroundings by an architecture of accepted monumental forms. An example of such a building constructed in recent times is the City Hall of San Francisco.

Such, in a general way and very briefly sketched, is the subject of public buildings. The special cases are innumerable. In all cases, however, the problems must be studied with regard to the conditions of the city as a whole, and of civic growth. The conditions in modern times are such as to require a recognized general scheme of development of public buildings and of the city as a whole. And recognition must be given, on the one hand, to the conditions of economy, and on the other, to those of the fine expression of civic ideals.

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CHAPTER VI

NEIGHBORHOOD CENTERS

The neighborhood center is the group of buildings and grounds in which provision is made for the various educational, recreational, and social functions of the city. It may fairly be considered to concern, as far as anything out of the home can, that portion of our lives which is beyond such absolute necessities of existence as safe and convenient places to eat, sleep, and work—that is, our mental, moral, and physical upbuilding.

In the planning of a city all municipal services fall naturally under one or the other of two heads: general, serving the entire city, and special or local, serving restricted neighborhoods and repeated in successive districts. This division is particularly important in the consideration of the group of public and semi-public activities which make for cultural progress and civic welfare. For the most part, these provisions will be designed to serve a surrounding district of limited area only, the size of which will be governed principally by the maximum distance that people will go to take advantage of them.

A comprehensive city plan must be adopted if a city is to provide adequate neighborhood centers where they are needed throughout its area. Unless such a plan is followed, the best suited land will not be acquired in advance of building and the corresponding increase in land values; and this delay will inevitably force cramped facilities, often poorly placed in relation to the district to be served, and

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costing far more than if land were taken in advance. For example, whereas, in New York, Central Park cost but $5,028,844 or less than $15,000 per acre, three small downtown parks, purchased fifty years later, after they had been densely covered with buildings, cost $5,232,363 or over $500,000 per acre. Figures elsewhere, though not so startling, are equally conclusive.

Public facilities gain in dignity, convenience, and economy if grouped, instead of being scattered, regardless of one another, throughout the district they serve. This is especially true of the educational, recreational and social elements of the city plan. Not only is the architectural effect of buildings greatly enhanced by their becoming units of a large composition, and by being visible across the necessary open spaces at a far more effective angle than when seen merely along a street, but, of far greater importance, the service rendered is vastly increased, both through the economical interlocking of the various facilities in such an arrangement, and especially through the increased use apt to be made of a single comprehensive plant in contrast with scattered units, each of which must be sought separately. Looked at in this way, the neighborhood center properly constitutes a single plant which serves the needs of all ages from the play of the youngest child to the quiet reading of the elder citizens.

There are, however, limits to the effective grouping of neighborhood activities, largely due to the variation in the size of the district served. Thus, children of school age are often required to attend school from a radius of a mile or more, whereas neither the little children nor adults are likely to be attracted with any frequency to playgrounds or social centers more than a fraction of that distance away. Moreover, since certain minimum provisions must be made, the element of cost is also closely bound up in the determination of the proper size of districts to be served: for ex-

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ample, swimming pools must be of at least a certain length and corresponding cost, or else they will fail of their purpose entirely through not quite meeting the needs for which they are supposed to be designed. On the other hand, to justify any service, it must be utilized or at least encourage utilization fairly close to its maximum capacity. The swimming pool referred to must be used or anticipate being used at some time practically every day by a very considerable number of people, or else the per capita cost of the service will be exorbitant.

The propriety of grouping the neighborhood center with certain other public property, such as fire and police stations, has been questioned on the more or less obvious grounds of noise, distraction, and moral effect. On the other hand, local municipal halls and particularly voting places are most appropriately placed in it, as the center should typify in every possible way the community interests. Quasi-public buildings, such as churches and clubs, will benefit by association with the open group of neighborhood center buildings, while on the nearby thoroughfares, if the site is well chosen, theatres, cafés, and similar buildings will naturally be erected.

It is believed that the question of relative cost effectively disposes of the argument in favor of decentralization of special buildings throughout the residential sections, for, though this scattering may have certain advantages in raising the entire tone of the community and in permitting the use of one particular type of facility without the distraction attendant upon visiting a combined plant, the inevitable increase in per capita cost, due to fixed charges of oversight and the impossibility of utilizing the special building to its fullest capacity throughout the day, would make it quite impossible for the average city to furnish more than a small portion of the facilities possible in the combined plant.

One difficulty met at the outset in planning a system of

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neighborhood centers is the present state of flux in the views as to the relative importance, and especially the relative distinctness, of the various educational, recreational and social functions. Thus it is increasingly recognized that play not only builds up the physical body but is a very important educational factor, particularly with young children, while, on the other hand, adults derive much educational value from social amusements, the primary purpose of which may simply be for pleasure. The present tendency seems to be definitely moving towards considering all three as a single combined function, though as yet we have no one term to embrace it.

The opportunities for development in the typical American home appear to be growing steadily less, so that even the play of the very small children is coming to be considered as a municipal function. In the early stages of the life of a child he needs chiefly physical action, but as he grows older he uses increasingly mental processes, with shorter periods of play. Re-creation, using the term in its derivative sense, becomes of constantly greater importance, for there arises the need of relief—change in activities—partly to be met by relaxation, but in youth especially requiring active recreation and the incentive supplied by games. Education proper should not only develop the intellect, but should also fit the student for his life work, and, secondarily, provide an avocation. The responsibility of earning a living, it is to be noted in passing, should be assumed gradually through the medium of continuation schools or apprenticing.

With the change from long hours of education to, let us hope, not unduly long hours of work, recreation becomes of even greater importance. In this era of machines our bodies tend to deteriorate; and our work seldom gives marked enjoyment, without which it is now believed that we cannot develop our greatest effectiveness. To both of

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these needs recreation supplies the necessary stimulus: in play we exercise and are happy, and at the same time avoid all the misguided attempts of the individual to satisfy these needs in "the easiest way," which, unfortunately, only too frequently means still further deterioration and the destruction of happiness.

At this period education becomes more and more merged with social activities, such as lectures and amusements of all sorts, particularly the moving picture shows. More attention is required in directing moral and emotional development through wholesome social intercourse. Now, too, political interests become important. Recent progress has been very rapid in utilizing the same facilities—the school and social center—in developing political consciousness and civic spirit. The neighborhood center also affords opportunity for family use, for the mother can bring her child to play and at the same time enjoy rest in company with her friends; father and son will go upon the same playfield; and many kindred opportunities will occur.

Types of Centers

In this brief outline of the functions of a combined neighborhood center, many important items have been omitted or barely mentioned, as the whole subject is exhaustively dealt with in certain of the books cited in the bibliography which is given below, and it was desired simply to indicate here the relationship of the various activities to be provided before going on to a consideration of them seriatim. Categorically they comprise:

1. The playground of the small child, age two to five or six.

2. The combined school and recreation plant for the older children, age five or six to twelve or fourteen.

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3. The combined high school, continuation school, vocational school (and college), and recreation facilities for youth, age twelve or fourteen to sixteen or twenty. (Two and three should, however, not be sharply divided.)

4. The combined social and recreational centers for adults.

Two practical difficulties at once arise in attempting to combine all these buildings and grounds in a single plant. Boys and men require large areas for outdoor games; small children will not walk habitually more than a quarter of a mile to a playground. Fortunately boys and men will go some distance, a mile or more, to find a ball field, so that a few large athletic fields, preferably in connection with certain of the recreation centers, will meet their demands. It is quite feasible to supervise such ball fields at some distance from a neighborhood center.

The needs of the small child would appear to be most adequately met by the so-called "block playground," an open space reserved in the interior of every block, where it is to be noted land is actually comparatively cheap, and an open space is already needed for light and air. In congested districts such a space need not exceed three or four per cent. of the area of the block, say thirty or forty feet by one hundred feet. In suburban sections, where new subdivisions are being laid out, it may prove practical to include fifteen to twenty-five per cent of the total area in such common spaces.

In a report on "Suburban Planning" recently completed by the writer for the Detroit City Plan and Improvement Commission, it was shown that with ninety-six blocks to the square mile—that is, streets one sixteenth of a mile apart in one direction and one sixth of a mile in the other—a playground of one and two thirds acres could be left in each block, and the lots would still be eighty feet deep; and even in the case of the minimum size blocks, one hundred

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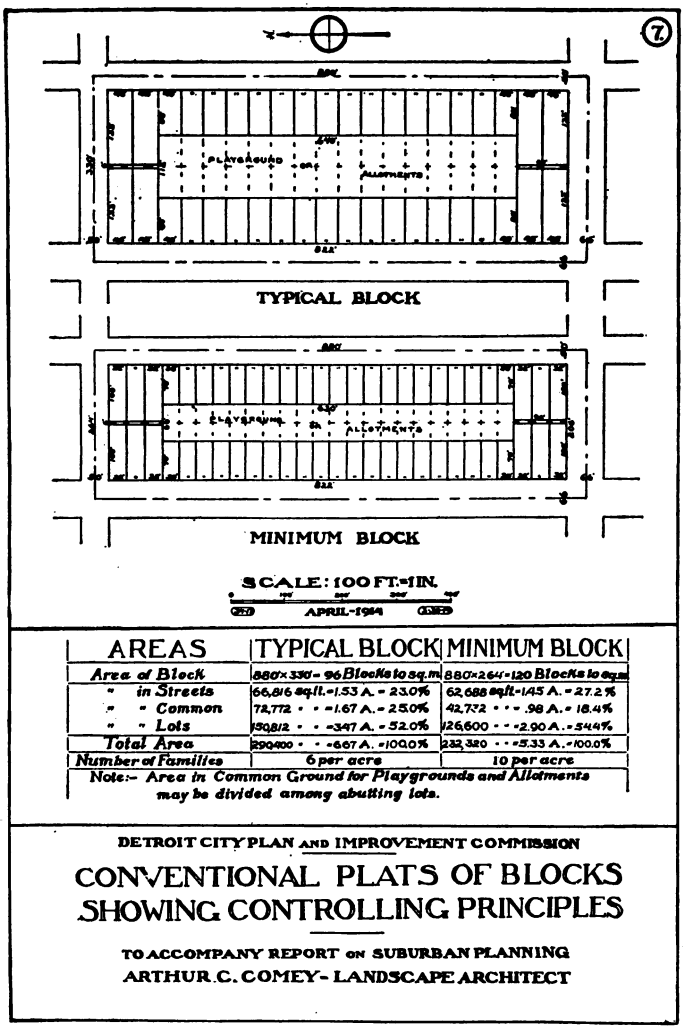

AREAS	TYPICAL BLOCK	MINIMUM BLOCK
Area of Block	880×330 = 96 Blocks to sq. m.	880×264 = 120 Blocks to sq. m.
" in Streets	66,816 sq.ft. = 1.53 A. = 23.0%	62,688 sq.ft. = 1.45 A. = 27.2%
" " Common	72,772 " " = 1.67 A. = 25.0%	42,732 " " = .98 A. = 18.4%
" " Lots	190,812 " " = 3.47 A. = 52.0%	126,600 " " = 2.90 A. = 54.4%
Total Area	290,400 " " = 6.67 A. = 100.0%	232,320 " " = 5.33 A. = 100.0%
Number of Families	6 per acre	10 per acre

Note:- Area in Common Ground for Playgrounds and Allotments may be divided among abutting lots.

DETROIT CITY PLAN AND IMPROVEMENT COMMISSION

CONVENTIONAL PLATS OF BLOCKS SHOWING CONTROLLING PRINCIPLES

TO ACCOMPANY REPORT ON SUBURBAN PLANNING
ARTHUR C. COMEY - LANDSCAPE ARCHITECT

twenty to the square mile, one acre of common ground in each block would still leave lots seventy feet deep, as shown

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on the accompanying plan. It is believed that this reserve of interior land may come to have a marked influence in improving living conditions, for, in addition to the play area for small children, provision may also be made for allotment gardens, tennis courts, and other common interests.

For small children the block playground should have no regularly open access to the street except through abutting property, so that a mother can let her child out into it with the assurance that he will not wander out upon the street. The ground requires little, if any, supervision beyond that given by the mothers, and but little equipment, the most important being sand boxes and swings. The children should also be given large wooden blocks for building. As the children approach school age they will tend to go more and more to the nearest neighborhood center, the value of the block playground being thus in a large measure restricted to the youngest children. Even in congested districts it can, however, be made an attractive breathing spot, with a few light shade trees, climbing vines and, possibly, flowers. Compared to the street, which is often the only alternative, such a spot offers great relative privacy and makes for neighborliness, both of which are only too often sadly lacking in modern city blocks of rented houses or tenements. If not completely shut off at night the ground should, of course, be lighted, but this need already applies with equal force to the alley, which the playground is apt to replace.

If this ideal provision of a little children's playground to every block is impracticable, larger grounds must be provided within a quarter of a mile, at most, of every child. Such grounds should be supervised, and will naturally offer somewhat more elaborate facilities, thereby attracting older children. The size should be definitely related to the number of children served, thirty square feet per child being

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considered a minimum, and seventy-five to one hundred square feet the ideal ratio. This type of playground provision is now becoming quite generally the practice in progressive American cities, and if thoroughly carried out will meet to a reasonable degree the requirements for play of the small children.

Location of Centers

Turning now to the consideration of the neighborhood center itself, let us first consider its location. Three factors control the ideal location: first, frequency, that is, the extent of territory each center can serve; second, access; and third, relation to its immediate surroundings, such as streets and thoroughfares. Several elements enter into the effective radius of each facility; and it is possible here to indicate only the method by which the area served by the combined center may be determined, and to give certain empirical conclusions.

The first point for consideration is distance, that is, how far from home people will customarily go, or, as in the case of schools where attendance is compulsory, how far they should be expected to go to reach the center. The element of compulsion works in another way, also, as it gets comparatively young children into the habit of going much farther than they otherwise would go to reach a playground separate from the school. The only satisfactory way of determining the "effective radius" of any facility is to plot on a map the residence of all those regularly attending it and discover the radius of a circle that will include the great majority, say eighty per cent. This method will give existing conditions accurately, but is still an incomplete criterion for any proposed provision. Speaking broadly, a half mile is found to be close to the limit of effective service of most recreational and social facilities.

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A second element is density of population, that is, the number of people within the area served. Except in very densely populated districts, however, this factor will seldom control the frequency of centers, as it is usually more economical to enlarge the capacity of the various units than to repeat them in additional centers. Nevertheless, in tenement districts, a radius of a quarter of a mile will often include as many people as can be handled to the best advantage in a single center. This limitation, in turn, is frequently modified by the existing conditions, such as extensive bodies of water and property used for railroads and other non-residential purposes, including large parks which by their presence reduce the number of people within reach of the center.

The effect of physical conditions is closely connected with the factor of access. Barriers, such as topographical features, may be absolute, as in the case of wide rivers, extensive railroad yards without crossings, cliffs and even steep ridges; or partial, such as long hills and valleys to be crossed, extensive areas of industrial or business property, grade crossings, and, for children at least, heavy traffic thoroughfares. Centers should be located so as to avoid, as far as possible, these hindrances to free access from within their districts.

More immediate approaches are of equal importance, as the relation of the center to its surroundings depends largely upon their arrangement. The center should be located near one or more thoroughfares, but not directly upon them, primarily on account of noise from traffic and danger to the users of the center, particularly children. Furthermore, property on main thoroughfares is more expensive and should be retained in the taxable list, while at the same time a neighborhood center will enhance an interior district in value more than it would neighboring thoroughfare frontage, which already has a high value due to

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other causes. From the thoroughfares, however, adequate approaches should lead directly to the main entrance, which should be plainly visible—for example, at the end of a short street—so as to be readily found. One other topographical condition is of vital importance: the ground must be level, or at least capable of being graded into a few broad terraces.

Opinions differ as to the advisability of having street frontage on any or all sides of this type of public property in common with certain others. The argument in favor of such frontage is based on the fact that the neighborhood center is thus easily policed and lighted, entering from private property is prevented, the esthetic effect is enhanced by houses fronting on it instead of back yards, which are likely to be unkempt, and values of the facing properties themselves are increased on account of their park-like outlook. This last advantage may, however, often be questioned on account of the noise on a playground; and it is now considered that the actual benefit due to a neighborhood center is spread over several blocks on all sides instead of being confined to the adjoining frontage, as is typically the case with such improvements as boulevards.

The argument against street frontage is based chiefly on saving in cost of pavement, and, in fact, the land for half the street itself, as this land is considered to come from the usually none too large area set aside for the park. Privacy and saving due to the reduced amount of untaxable frontage are other reasons urged. In the concrete cases that frequently come up, expediency coupled with these factors may be sufficient to justify an interior location. The buildings should, of course, face on a street, so that possibly a combination of the two ideas, with private property on not more than one or two sides, will frequently prove most satisfactory.

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The controversy over the question of placing neighborhood centers in or on the edge of parks may be quickly disposed of by considering them as additions to the parks and acquiring the necessary land upon this basis. Under these conditions there are certain marked advantages which such a center will have over others placed in the midst of blocks that are built up. Its approaches, or some of them, are apt to be far more attractive and conducive to recreation in themselves. Its open spaces appear more liberal in conjunction with the open park, and its play fields may very often be extended into the park without detracting from the value of the latter. Furthermore, in parks of some size opportunities for rambles and nature study are close at hand. In the case of a very large park, however, the question should always be taken into consideration as to whether a neighborhood center located on its border is not too far to one side of the area served. It must constantly be kept in mind that the justifying value of a large park lies in its broad appeal through beautiful landscape, and that once this is destroyed, the park itself would better be broken into small bits scattered through the city. It can hardly be urged, however, that, for example, the tennis players or the children on the Playstead at Franklin Park, Boston, detract from its beauty; on the contrary, they add life and picturesqueness to the landscape.

Facilities of Centers

Having considered the broad need and scope of neighborhood centers and their location and surroundings, we may now take up in more detail the facilities to be provided and the management of them. The building plans, however, will in this article be in the main simply blocked out, as several excellent treatises among those listed go

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into this matter in detail. Consideration will first be given to the necessary buildings and then to the outdoor features, with particular emphasis on their inter-arrangement.

It will be appreciated at the outset that practically all the indoor units can be combined under one roof or in a series of connecting buildings. This arrangement will naturally be a development of the most recent types of school architecture, combined with the essential features of the field house, as developed in the recreation centers of Chicago. It will contain—besides the usual class and teachers' rooms and kindergarten—rooms for domestic science, shops for manual and vocational training, laboratories, one or more auditoriums or assembly halls, library and reading rooms, social and rest rooms, lunch rooms, dispensaries, gymnasiums, pools, baths, and possibly open-air class rooms and a roof playground. For use with the outdoor playgrounds, as well as the gymnasiums and baths, there will be extensive locker space. On the side of the building away from the class rooms there may be an outdoor pool. Adjoining the kindergarten there should be an outdoor shelter, which may at the same time roof over part of the small children's playground.

The outdoor units will be a playground for boys and men, a playground for girls and women, a playground for small children, and space for school gardens. The school gardens may be made to occupy several acres, but in the crowded city hardly more than an acre at most can usually be spared for this activity. It should be noted, however, that if we are to people our garden suburbs and make the gardens successful, intensive gardening must be taught to adults as well as to the younger generation. Much of this may effectively be done as university extension work, assisting families to cultivate their own back yards, but a central tract, and possibly even a system of cottages on lease during instruction, is now being urged as the only

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adequate method in at least one state (Massachusetts).[1]

The small children require about one acre, the girls two acres, and the boys at least that and preferably twice as much, and also, if room is available, a ball-field or two and space for tennis and other field games. Allowing an acre for buildings and adjoining grounds and another acre for the school gardens, we find a total area of seven acres absolutely essential, while even twenty acres is none too large, this being the present standard in at least one progressive city (Gary, Indiana).

Given a relatively level site of ten or fifteen acres, the disposition of these five or six units should be with a view to the greatest convenience in use and economy in service. Esthetic considerations, such as architecturally effective placing of the building, must come second. It will usually be found desirable to locate the building on one side of the tract and not more than fifteen or twenty feet from the street, unless it be a traffic street, so that the smaller grounds can be placed on either end of the building and the larger fields across the back, if any side of it can be called the back. This will permit a certain amount of ornamental planting across the street front. thereby forming an appropriate setting. Moreover, as a ten-acre ground will almost certainly block one or more streets, the building may usually be placed so as to terminate a vista. Obviously, a central location would be very wasteful of land, especially on a small tract, and make it quite impossible to develop any large play spaces at all. Furthermore, all the outlooks would have to be on play areas and the windows on all sides need to be screened. If the building is placed on the north side, as can usually be done, it may be made to present windowless walls on the south ends of its wings toward the playgrounds and it will at the same

[1] *See* Massachusetts Homestead Commission, First Annual Report (1914), and Bulletin 3, January, 1915.

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time afford protection from winter winds and warmth in the sun.

Trees placed around the edge of the tract and between the play fields will afford sufficient shade during the summer. The use of shrubbery, however, has been condemned on account of the moral hazard involved, though it is at least a question whether the fault does not lie with the method of supervision. A few well-designed shrub masses at the base of the building and along the border and at the corners of the grounds will greatly increase their attractiveness. About the only other practicable planting will be vines on the building and hedges or vines on the fences.

There is still some difference of opinion as to the desirability of fencing, but with such an elaborate plant as that outlined in this chapter a fence would seem to be essential for protection of property alone, if for no other reason. The argument against the fence is based on the fact that it prevents the incorporation of the sidewalk into the play area, it practically wastes a strip several feet wide adjoining the fence, and at the same time it necessitates long detours by the gate in order to go upon the playground or to leave it. Furthermore, it involves a very considerable expenditure of money. In favor of the fence, however, is not only the argument for protection of property, but also protection of the children by keeping them off the street with its very real dangers since automobiles have come into general use. At the same time the street is preserved for its original purpose of communication. If the playground is too small, enlarge the ground, do not usurp the street. There must, of course, be exceptions to this rule where adjacent land is covered with improvements or held at prohibitive figures, and where the street on the other hand is not a main traffic way. In fact, in congested districts certain local streets may well be turned into play spaces and vehicles excluded, except during certain hours.

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Aside from these more or less obvious advantages of fencing, certain incidental reasons have been emphasized by conditions on unfenced playgrounds, especially the unregulated use of apparatus at hours when there is no one in attendance, particularly at night. This is usually the chief source of annoyance caused by playgrounds to the immediate neighborhood. The use of fences also makes possible the division of the ground into separate spaces for boys and girls and little children, thereby distinguishing these areas sharply from the surrounding land, and fostering a sense of unity and loyalty among the children.

The type of construction of the fence requires some attention. It must be permanent and sightly, and at the same time not unduly expensive. In congested districts a steel picket fence may be the only satisfactory type in spite of its relatively great cost. A heavy woven wire fence placed within a privet hedge is very attractive and practical; or, if every foot of room must be made usable, vines, such as rambler roses or honeysuckle, may be grown upon it. Whatever the type of fence, it must be of close enough construction to prevent balls from going through it.

The exact placing of each play area is very important indeed, as otherwise the ground may not serve more than a fraction of its greatest capacity. Each game and other activity should be assigned a separate space, and whatever equipment is used should be permanently fixed so that that game will be played there and not interfere with the rest of the ground. This, of course, does not mean that the entire area shall be cluttered up with fixtures: a central open space adapted to various games requiring no apparatus is often the portion of the area that is most used. In this chapter the various games will simply be touched upon briefly, for the most part, as their detailed requirements, with measurements, orientation, and equipment, are completely dealt with in the text books on the subject.

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Baseball is the universal game but unfortunately requires a great deal of space for a very few actual players, though many others may derive pleasure and some benefit from watching them. A standard field requires an area some three hundred feet square or two acres, and is, therefore, often impracticable in congested city districts. However, boys will play on a space of one half these dimensions, and for even more congested districts the now popular substitute, "indoor baseball" or "playground ball" so called, may be provided. In fact, this modification of the game brought about by the necessities of the case has many attendant advantages, as it is much more sociable and makes for simpler pleasure than the highly scientific playing for which all baseball players strive.

Of the other field games American football is open to the same objection as to space, since it requires an area of one hundred and sixty by three hundred and sixty feet, though boys will enjoy a game on a much smaller field. Two football fields may be laid out in the autumn on a single full-sized baseball diamond. These two games have, of course, the lure of national interest, so that many boys are attracted to play who might not otherwise come at all. Association football ("soccer") has less general popularity, though in many respects it is a better game, as it requires less careful training to prevent serious accidents. It also may be played on a regular football field. Other games on the same field include cricket, lacrosse, and field hockey, each of which has its devotees. The natural place for a running track is around the football field, which will allow a standard quarter-mile track, with space for most of the "field events" in the curved end of the track. A combined playfield of this type will occupy three acres or more.

Popular games requiring less space and therefore more generally available for city playgrounds are basket ball, 50 by 70 feet; tennis, 56 by 118 feet; indoor baseball, 35 by 35

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feet; tether ball, a 20-foot circle; and the excellent game of volley ball, which may be played indoors or out and has no exact requirements as to space.

The spaces occupied by fixed apparatus should be planned with the same care as the games. Swings, see-saws, giant stride, slide, and an outdoor gymnasium, with bars, ladders, and rings, all have their places, though undue emphasis should never be laid on equipment to the detriment of supervision and participation in "ring games" and exercises. On the smaller children's playground sand bins are almost an essential, and a wading pool should be provided whenever possible, as it undoubtedly gives more pleasure and healthful recreation in extremely hot weather than any other single provision. In winter it will afford a little folks' skating pond, where they will not be disturbed by the older boys and girls. For the latter a portion or all of the playfield should, if possible, be flooded and the ice kept free from snow. Coasting is not adapted to the restricted area of a neighborhood center and must, as a rule, be confined to the parks proper.

In addition to these typical playground features, it has been found very beneficial, where tried, to provide opportunities for the care of pets and other animals, which may also be studied in connection with natural science courses. Carpentry, building, and other similar activities should also find room in which to be taken up by those interested.

It almost goes without saying that the grounds should be lighted, and lighted brilliantly, with an ornamental system, which may be definitely related to the architectural design, but must, first of all, light effectively all the area used. A large proportion of the patrons of the neighborhood center have to work during the daylight hours and, lacking the playground, their usual recourse is the picture show, dance hall, saloon, or worse. All the outdoor games, with the possible exception of baseball, may be played by

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artificial light, so that indoors and out the combined neighborhood center will be used fourteen hours, six or even seven days in the week. Interesting figures have recently been compiled by Mr. George A. Parker, Superintendent of Parks at Hartford, showing the cost of various recreations per person engaged in each. The general use of playgrounds has cost about 0.71 cents per person using them; the outdoor gymnasiums 0.33 cents; baseball 0.36 cents; football 1.02 cents; skating 0.83 cents; tennis 7.35 cents; and school gardens 1.12 cents.

Gary System

In support of the efficiency of the combined school and recreation center, Mr. Henry S. Curtis quotes the Superintendent of Schools of Gary, Indiana, where this method has been most completely adopted, "Mr. Wirt has shown that the number using the gymnasiums and playgrounds of the Emerson School, Gary, is nearly equal to the number using the eleven gymnasiums and playgrounds of the South Park system of Chicago, and the cost of installation in Gary is about one twentieth of the cost in Chicago, and the cost of maintenance is about one sixth as much." These two systems, the schools of Gary and the recreation centers of the Chicago South Park system, constitute probably the best examples of their respective types of provision. The balance, financially at least, strongly favors the Gary system.

In the Chicago South Side system, unusual financial resources, coupled with the very typical difficulty of getting results through the routine school organization, pointed to the establishment of an entirely separate series of units fitted out in a very elaborate and complete manner and providing solely for recreation and incidental social uses. Their magnificent plants, occupying often twenty acres, remain

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the highest type of equipment in this country and as such have been a lasting inspiration to other cities in their efforts to secure satisfactory provision for neighborhood recreation. Not only in their broad lines, but in every detail, careful study has been given to produce the most effective results. Unfortunately, however, few cities have the resources to make such ample provision for recreation, and some sort of compromise becomes necessary. It is here that the merits of the combined plant are found to outweigh by far the advantages attendant upon separate provision of recreation facilities; for with insufficient outlay the mark is apt to be missed entirely and the money thus almost wasted, whereas, if combined with the educational plant, a very limited amount will immediately produce valuable results.

It would seem, therefore, that the Gary method is more closely adapted to the needs of most American cities. With the details of its operation this chapter is not concerned; they are excellently set forth in a recent United States Educational Bulletin. Suffice it to say that the children move about for a half or three quarters of their time to special lecture rooms, laboratories, shops, gymnasiums and the playground itself, each place being under a trained teacher or director and all a part of the regular curriculum. They thereby not only vastly increase their benefit from the school, but at the same time economize on class room, since two, three, or even four sets of pupils may use the same regular rooms. The resulting saving is sufficient to pay all the additional costs of special instruction and special equipment. The school is open Saturdays for voluntary attendance and evenings for both young and old. The school year consists of four quarters of twelve weeks each, attendance in any three quarters only being required. In these ways the children are given the motive for coming to school and do come to the limit of their time. A plan

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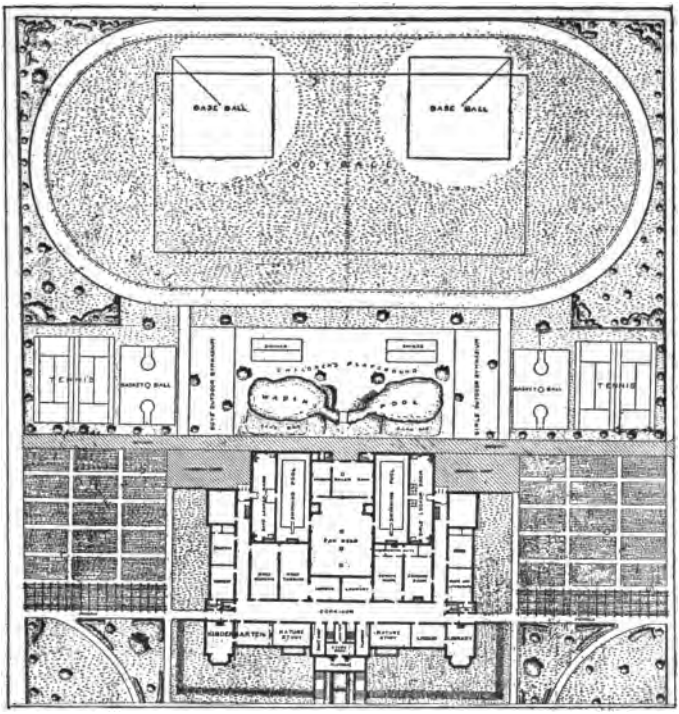
of the grounds and lowest floor of the building of one of the recently constructed Gary School Centers is given in this chapter as typifying the latest advance along these lines.



PLAN OF FROEBEL SCHOOL AND PART OF SCHOOL GROUNDS, GARY, INDIANA

A system of neighborhood centers of the type indicated in this chapter is believed to be possible of attainment by any American city. The beginning should be made, as at Gary, with the new installations in the growing districts; and then, one at a time, the best suited of the old school

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buildings should be remodeled and their grounds enlarged. to meet the new requirements. In choosing these as well as the new sites, particular attention should be given to the grouping of civic buildings and the location of centers with respect to the areas served and ease of access. The city plan should indicate these sites in advance. In this manner all progressive American cities may ultimately provide adequate educational service of the broadest type, and thus meet fully the educational, recreational, and other social needs of the community.

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CHAPTER VII

GENERAL RECREATION FACILITIES

At the outset, it is well to define the term recreation in its relation to city planning. The idea of city planning is so to provide for a community that its members shall be constantly improving in their beneficial relation to it. Recreation is a part, an important part, of that improving relation, and it may easily be defined by simply inserting a hyphen after the word's first syllable. Re-creation, making again, renewing, restoring; in short, upbuilding after down-pulling; such, in a community, is the function of recreation.

That this is not at all generally understood by the mass of the community members I need hardly more than state. Recreation, in the mind of the average American citizen of any sex, age, or climate, spells primarily enjoyment; it is pleasure, relaxation, "a good time." This average man is right in a sense, and as far as he goes; but he does not go far enough. Some men above the average, honestly interested in their fellow men, think of recreation as a sort of civic dessert, a "frill," a showing forth of the community's riches. They do not really conceive the word or what it means as at all vital to the community's welfare. It is, as they see it, desirable to afford to their fellow-citizens the pleasure of a park, the fun of a playground, but the close relation of actual working efficiency to the opportunity for upbuilding recreation has not occurred to them. Such citizens dominate a certain city—and there

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are others in which the same condition prevails—which has a park with flower beds and architectural adornment, and is, nevertheless, almost wholly without civic recreation facilities.

In this chapter I shall look at recreation as having for the community of any size a most important relation to its productivity in people and wealth. I shall write upon the assumption that the work of any man, woman, or child in an American town or city, or even more in the open country or the small village, entails a daily depletion of vital force, beyond that provided in food and sleep, which must be restored if production in the individual and the community interest is to be continued in full efficiency. Further, I shall assume that as a part of city replanning, greatly needed all over America, proper recreation facilities will tend considerably to increase the community output in quantity and in value.

It is necessary to take yet another view of the function of properly managed community recreation—that it is a competition with the forces of evil, the down-pulling facilities that thoughtlessness has permitted to be prominently put forward and actually legalized.

So definite and natural is the necessity for recreation that in all recorded time man has himself undertaken it in some form. Not only does "all work and no play make Jack a dull boy," but Jack simply won't work all the time, and never has done so. A very capable and experienced inquirer and student, Mr. George A. Parker, has estimated that in a city of a hundred thousand, assuming that all time not used in working, sleeping, or eating is recreation time, every individual spends an average of five hours in each twenty-four in recreation, independent of Sundays and holidays. When the sum of this time is taken—20,833 days or fifty-seven years of recreation time *each day* in a city of a hundred thousand permanent population—it is not

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hard to understand why vast enterprises are carried on to claim as much of it as possible.

The saloon, the theater, the dance-hall, the "movie," all depend upon diverting a portion of this time, with its consequent money expenditure, which Mr. Parker estimates at two cents per recreation hour or ten thousand dollars per week-day in the city of a hundred thousand. He found that in cities where the individual recreation expenditure was as low as one cent per hour, "the city was hardly a livable place." The lecture-hall, the church, and all the forces of good compete for this time and this money; but how inadequately anyone may determine who will use the same general formula for his community, comparing then the number of churches and the hours they are open, on the one side, with the number of saloons and the hours they are open, on the other. These two are thus mentioned on the assumption that the church is entirely an upbuilding agency and the saloon a down-pulling agency—an assumption few will attempt to combat. I do not here assign the "movie" one way or another.

To answer an obvious query concerning this recreation formula, I may say that it is considered that school hours for children count as work, and that the transient population in any city, as well as those not doing any actual productive work, will make up for the time of children too young for school. It may also be said that for larger cities, with generally shorter hours of labor, the tendency will be for more recreation time, and larger recreation expenses; while for smaller communities the average will probably hold at five hours per individual.

This is not the place to discuss with fullness the recreation problem for the rural population, yet it is surely a most serious problem, affecting more than one-third the population of the United States, and needing attention for that reason. I suspect that the movement from the coun-

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try to the city will tend to diminish when thoughtful men and women rid themselves of the unwarranted idea that a worker in the open country does not need, or does get without specific provision, that upbuilding recreation which runs with content, happiness and increase in moral and financial worth.

It is probable that this volume does not take up the needs and the difficulties of the smaller communities in which live, in the aggregate, many millions of people, and that, therefore, I may not more than mention the need for recreation facilities in these hamlets and villages, assumed to be closer to the open country than to the crowded city with its disadvantages. Any thoughtful person who will undertake to inquire into the use of the time not used in working, eating, or sleeping in ten average communities of less than twenty-five hundred population will find an appalling condition. Let him listen to the conversation at the gathering places—for these people are not immune to the necessity for recreation—and he will hardly find it upbuilding. Let him consider the provisions for play, and he will probably find that the only way for boys to engage in America's body-building national game of baseball is by either actual or tacit trespassing. Where are the equipped playgrounds to make boys and girls strong, agile, graceful, and orderly? How about the tennis courts? As for other recreation facilities, he will find the church about the only force for good, with the saloon or the country tavern usually doing a much larger business.

I have in mind a mountain village of about two hundred permanent population, having two year-round churches, one general store, and no saloon. The people are honest and upright to an unusual degree. During the summer there is an increase of population, through the coming of a transient population of eight hundred or more to enjoy the lake which gives name to the village. Now it has been

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found that the boys of this little village, honest and truth-telling above average, are unpleasantly destructive. Why? Because they have no recreation facilities whatever. And the men, all of whose income is derived from work in connection with the summer resort, are idlers for seven or eight months. They have no handicraft, they produce nothing; they are untaught save in that which the school provides. That little village, under some form of encouraged recreation effort, could soon double its material worth and increase its potential citizenship value tenfold.

There were in 1910, in the United States, 11,784 organized or incorporated communities having less than 2,500 inhabitants, but including a total population of 8,118,825, or 8.8 per cent. of the people in continental United States. To a painful extent these communities combine all the disadvantages of the country and the city, with mighty few of the advantages of either! Housing conferences overlook them, city planning is unknown in them, recreation facilities are comprised mostly in what the churches, the saloon, the "movie" and the cheap one-night-stand small vaudeville troop can do for them. I have seen vulgar posters displayed in these overlooked country towns announcing "shows" of such nastiness as would never be allowed in the large cities. "Anything to catch the rubes," say those who compete for the recreation time and money of those who are working on the land, or who live close to it in small towns. It is high time that other agencies enter the field, to build up citizenship, to increase intelligence, to add productive capacity, through the use of the recreational impulses. Adding the 1,172 places having between 2,500 and 5,000 inhabitants, we include 4,105,656 more people in the consideration, or a total of 12,224,481 inhabitants—just about the urban population of New York, Chicago, Philadelphia, St. Louis, Boston, Cleveland, Baltimore, Pittsburgh, Detroit and Buffalo combined. What would be thought of action

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or inaction which would result in giving the people of these ten largest cities no better recreation facilities than are now afforded to the little places?

But now there may properly be inquiry as to what proportion of the average recreation time of the individual ought to be looked after or competed for by the community as an organized body. Again I quote Mr. Parker, who is on record as desiring to have the hundred-thousand city's park department endeavor to provide for one hour per day, on an average, for each individual. He goes further in a novel desire to compete for the accompanying expenditure of two cents per recreation hour, and I shall refer to this later. Assuming as a basis the propriety of his desire to have the city's plan of operation provide for not less than 100,000 recreation hours each week day—and at least double on Sundays and holidays—we may consider what facilities would be required, and what expenditure would be incurred in that provision.

The first item in this consideration is proximity. It is obvious to any thoughtful person that the well-to-do in a community do not need the same intensity of recreational provision as do the workers. The man who has a salary rather than wages needs recreation for himself and his family—and he usually gets it, too! He can go after it more easily, and spend more for it, than can the wage-worker. I do not argue that he may be neglected, for he is very important; nor does he at all change the average demand. I do mean that the recreation facilities should not be located primarily for his convenience, but rather for the convenience of his fellow-worker for wages.

The families of the wage-workers tend to be larger than those of the salaried man. Take only an average family of five, and with the father away at his work and the mother at her housework, there are three children to consider. It is neither proper nor practicable to expect these

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children to go, unaccompanied, a considerable distance to a recreation center, a playground. They won't; they don't! The gutter and the street and the vacant lot are too near and too attractive. The children do not distinguish between upbuilding and down-pulling recreation.

It is, therefore, to be taken as axiomatic that instead of city planning, so as to take the people to the playgrounds, the better way is to take the playgrounds to the people, to locate the community's facilities, for at least part of its upbuilding recreation effort, right where the wage-earners live.

A notable example of the way in which this has been done may be seen in the small parks or recreation centers in the South Side and the West Side districts of Chicago. Right in the heart of these industrial districts, competing with hundreds of saloons, dance-halls and worse, are these city-provided spots of green, these "country clubs," as I might call them, of the people. In one instance fifty-seven houses were demolished to make place for the community center—a telling commentary on the expense of hindsight as compared with foresight in city planning. These Chicago centers average no less than ten acres each; they provide intimately for the recreational needs of the nearby population; they are not set forth as charities, but as proprieties, if I may so strain a word. And they are used by the people as a right, with self-respect; for they are provided *by* the city, all the city, *for* the city, all the city. Said the superintendent of the center nearest the great, grim, and bustling stock-yards to me one very hot July Sunday when I was seeing how Chicago cared for at least some of her people: "Yesterday after the quitting whistles blew, there came from the stock-yards to this center the regular throng, and 2,763 men used our shower baths!" Then I saw how this provision extended to all the recreational and, indeed, the social needs of the family, from

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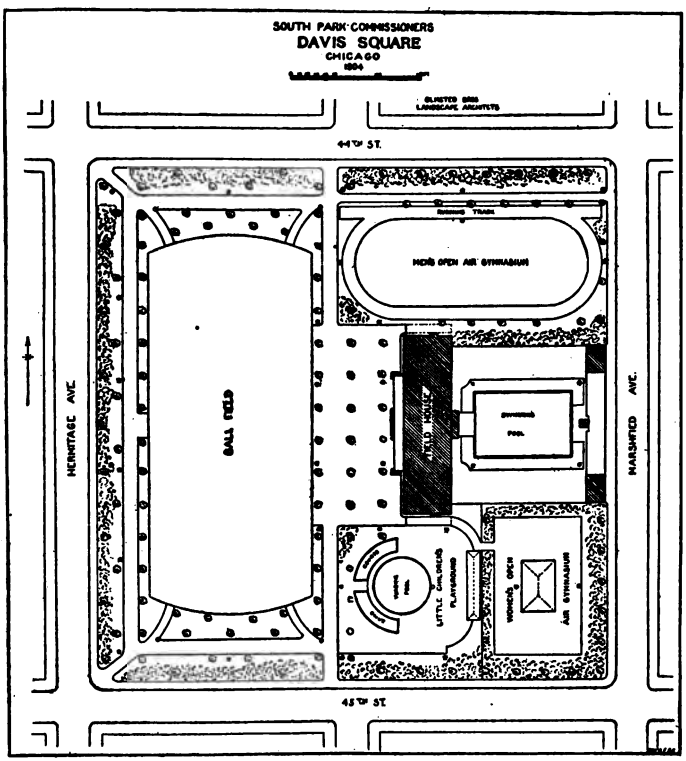
the baby playing happily in the sand-boxes to the young women having a party of their own in one of the assigned rooms of the impressive building that was an example of and for civic pride and provision. Folk dances were competing outdoors with a ball game; the refectory was selling



ice cream—of a quality unexcelled anywhere—at a nickel a portion, with milk, cakes and rolls at as near cost as they could be figured; boys and girls who were not in their own outdoor gymnasium were contentedly reading in their own library, under the eye of a child-loving librarian. But

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best of all, to me, was the hustle and scramble of other boys, a hundred at a time, as they got in line for a sterilized suit and towel preparatory to an hour in the great open-air swimming pool, as beautiful as any Roman bath of old.

Orderly? Yes, and without blue-coated restraint. For all were gentlemen and ladies using their own club, if you please, even though most of them would not have comfortably pronounced the name of the center in English!

Here then was the competition of the city with the forces of evil, not only for bodies but for souls, for citizenship, for working efficiency, for Monday-morning-on-the-job; here was Chicago's answer to the question as to being her brother's keeper: here was the shrewdest economy of city government! Is it any wonder that within a half-mile radius of these wonderful centers juvenile crime in 1910 decreased 44 per cent., while outside that radius it increased 11 per cent.?

I have thus broken into the orderly sequence of this discussion that I might perhaps doubly enforce the idea both of the value of definite recreational provision, and of the importance and efficiency of arranging it close to the population most needing it.

The time was when a city thought it had done well in obtaining a great park somewhere near the town, and in developing it with lawns and drives and flower-beds. Fine as it is to have such parks, we now know that they do not meet the need, do not efficiently compete, do not produce value in working citizenship comparable at all with the smaller areas nearer the people, and better arranged to serve them.

A recent thoughtful study of park service by Arthur C. Comey[1] presents graphically the idea that the one large park or wild reservation, which used to be considered as

[1] *Landscape Architecture*, July, 1915.

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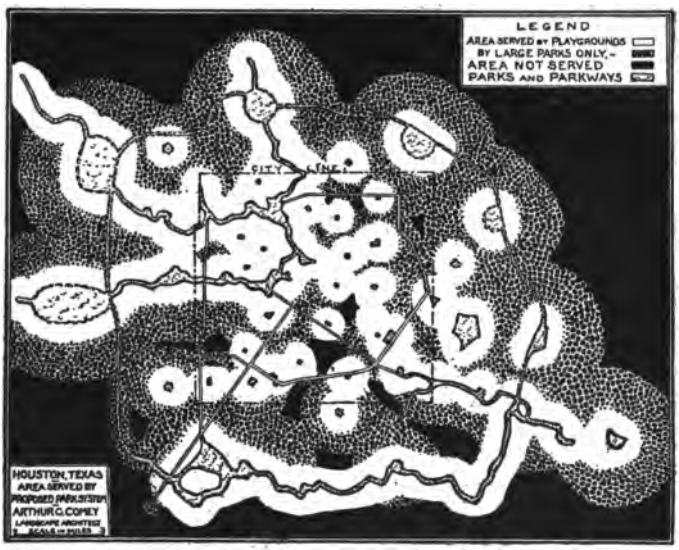
answering all recreational needs of the community of large size, has a very low operating intensity or efficiency. It is considered in this survey to have an effective radius of ten miles for once-a-week visits.

Inasmuch as I am obviously discussing the recreational features of city planning as applying to the numerous communities under a half-million, rather than to the few above



it, I may be pardoned for saying that there is little use in the large park of over two hundred acres in one body as compared with the recreation center and the small park and playground.

Mr. Comey's classification may here be quoted. He considers that a two-acre unit may be called a playground if properly equipped, while a twenty-five-acre plot is a recreation center, and an area approximating two hundred acres is a large park.

According to Mr. Comey's figuring of the effective radius

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of a playground, it is efficient only within one-third of a mile. The idea in Boston has been to arrange a playground, or parkway, or recreation center within a half-mile of every inhabitant. Wise city planning should, therefore, take into account an adequate provision of either playground or recreation center within not more than a half-mile of every inhabitant up to the population being provided for. If there is any variation from this formula, it should be toward greater provision in the congested and industrial population centers, and less provision in the more open and well-to-do residential centers.

In replanning cities, which, as I have before observed, needs to be done all over America, the same formula might be applied, as far as the cost of hindsight will permit. It has been found in the greatest center of population, New York City, to be cheaper to demolish important buildings in order to provide play space in a congested neighborhood than to provide additional policemen and bury more people who have died as a result of civic neglect. It has been found in other cities that carrying out this formula, even at some considerable expense, very fully rewards the city in the increased productive persistence at labor of the men, women, and children who are re-created in consequence of the civic provision.

Investigation seems to have proved that the recreation center of from ten to twenty-five acres, especially if combined with playground facilities, is the most generally economical item of a park equipment. I venture, therefore, to urge that in future recreational planning especial emphasis be laid upon what may be called a combination of playground, recreation center, and small park, of any possible area from two acres up to twenty-five.

Greater efficiency is obtained in these smaller areas if a waterway is included, and it is right, therefore, to call attention to the importance of making use of any waterway

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within a present or prospective city. I can call to mind at least a dozen American cities intersected by neglected, garbage-decorated, and frequently unsanitary streams, the picturesque value of which has long since given way to characteristic American disregard, but most of which might be rescued with vast benefit in efficiency, because, at a relatively moderate expense, they are likely to double the effective relation of recreational areas of which they would form a part.

In the same way it may be considered that parkways are of special efficiency. A parkway is not a mere grass-plotted street, but ought to include a minimum width of at least 120 feet, or, better, 200 feet, which, while providing access between items in the park layout, is in itself efficacious in affording the contiguous population an opportunity for passive recreation, or what the tired woman who sits on a bench placed on a grass plot under a tree would call "rest." Just here I may interpose a suggestion that it is possible, by proper arrangement, so to use a relatively small area as to combine in it both the passive and the active recreational provisions. Mr. Parker has, in Hartford, given an admirable example of this, and in a very simple and workable way. In the center of a small area he put the ordinary playground apparatus. This he surrounded with a close planting of trees and shrubs, backed up by fixed benches facing away. The result is that those inclined to activity have scope up to the limit of the space provided in the center of this little plot, while there is really delightful rest opportunity under the trees and on the benches facing away from the playground and considerably screened from its activity and noise.

Where there is opportunity, either by reason of gift, or low price, or fine natural features, or especial proximity, to include in city recreational planning the larger areas, it is certain that such action is well worth while; always pro-

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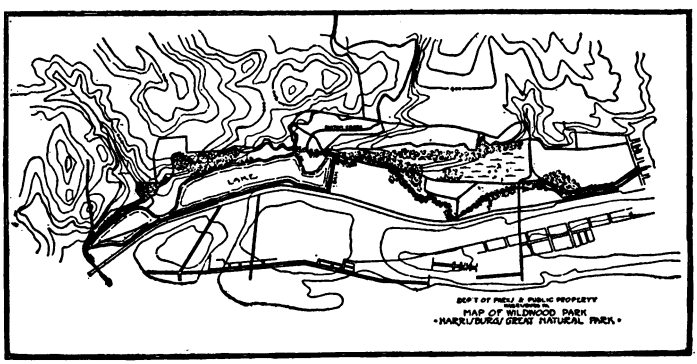
vided that it does not involve the neglect of the more intensive recreational facilities.

This larger park may be considered in three relations. It may be the relatively formal park; as, for instance, Central Park, in New York, where, with a reasonable attempt toward the showing of wild nature, there is, nevertheless, a definite provision of formal and architectural details. In the present stage of American recreational provision I should consider such a park as mostly a luxury, desirable



WILDWOOD PARK, HARRISBURG, PENNSYLVANIA

only after the larger needs of the community have been cared for.

The so-called "wild park," as exemplified in Franklin Park, Boston, in Wildwood Park, Harrisburg, and in numerous other fortunately placed areas, is a better use of a considerable acreage. In these parks there is usually natural woodland, and with minor clearing up this is left as woodland. I should be careless did I not suggest caution in relation to the handling of wild park areas under other than the most competent and careful landscape supervision, for well-meaning local park authorities, and some inefficient landscape architects. have committed great enormities in

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what they call "clearing up" in wild park areas. I remember one case, in a city which would not be happy at mention of its misfortune, where such action resulted in cutting out all the lovely native growth of shrubs and in trimming up the trees from the bottom to produce a grotesque effect. As soon as this mutilation was completed, the impropriety of it was noticed, and at once the park authorities of that city started to grow back again the things they had just torn out! By all means, the wild features of any locality should be preserved, with only such changes as will give access and provide entire safety from poisonous plants or other dangerous or objectionable conditions.

The third use of a larger area, and one not yet undertaken to any serious extent in the United States, might be in connection with a municipal forest. To my way of thinking, this is the best of all provisions for the larger park and recreational areas, because there would be in it a combination of recreational utility and financial utility. It is entirely practicable to conduct economic forestry in connection with recreational use, there being some slight giving way or compromise between the two aims. If a city, for instance, which would otherwise be able to carry but one park of two hundred or three hundred acres should instead be conducting forestry operations over an area of a thousand acres, it could be confidently expected that within the space of a generation the forest park would be serving quite adequately all the uses of a wild park, and at the same time fully carrying its own cost in actual timber production. It would also be providing as a unit, small but nevertheless efficient, for the conservation of climatic and meteorological conditions in a way which I am sure within the next generation will be found to be extremely important in the eastern United States.

Objection may be made that the municipal forests of Europe are frequently at a considerable distance from the

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city. This is quite true; yet, according to Mr. Comey's article above cited, people will go considerable distances, up to ten miles, without the forestry relation, and certainly up to twenty-five or fifty miles with the forestry relation, for week-end parties, or overnight camping, or for that ramble in the wild which answers a recreational need not provided in any other way.

The rapidly increasing efficiency of our national parks indicates the strength of this position as to the need of the larger wild areas, though, as yet, largely due to an unfortunate departmental separation, the forests and the national parks are not administered in harmony or in mutual service one with the other. It has been found that in a single year approximately four thousand families have teamed into the Yellowstone National Park to camp, some coming even a hundred miles for a week's inexpensive and upbuilding vacation.

It is probably not within the scope of this consideration to discuss the value of providing for vacation places at a low cost. I should call that consideration a part of state planning rather than of city planning. Nevertheless, it may here be merely mentioned as one of the items of recreational consideration that needs to be taken up; for it is certain that your chauffeur needs for his family a vacation opportunity in the open quite as much as you need that vacation opportunity in the open, while he must provide his on a scale of probably twenty per cent. of your expenditure. I conceive that the state can very well see to it that the man of limited income is given adequate and inexpensive vacational opportunities in publicly owned areas, for the upkeep of which he in common with his fellow citizens is taxed.

Possibly somewhat out of its order, and certainly very briefly, because the subject has been adequately written of elsewhere, I wish to discuss the playground relation. Em-

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phasis has been laid upon the need of playgrounds. Further emphasis needs to be laid upon the quality and maintenance of these playgrounds. A mere open space is not a playground. An open space equipped with apparatus is not a playground in the true sense. It is when the open space is equipped with apparatus and there is added the attention of skilled playground workers to teach and supervise and encourage play, from swinging and tennis-playing to cooking and raffia-weaving, that a playground really becomes an efficient part of a community's recreational facilities. I urge, therefore, that in city planning there be no lack of full consideration for the necessity of equipment and maintenance in connection with playgrounds.

A word may be said as to the proportional area required in recreational provision in average communities. There has been adopted a somewhat empirical formula to the effect that a well-planned city ought to have an acre of parks for every one hundred of its inhabitants. If this should be set as a standard, it would be found that in the United States not a half-dozen cities approximate it. At the moment I can think of but three that I am sure of, and the adequate and admirable area in one of these is rendered less efficient by lack of proximity, because one item of 106 acres is a large island in a great river, accessible only by an incidental rope ferry.

It will not be difficult to combine Mr. Comey's cited formula of efficiency with the ideal provision of an acre for every one hundred people in such a fashion as to show that in an average city there ought to be an *efficient* acre of recreation space certainly for every two hundred and fifty people. In planning new cities the more liberal proportion would unquestionably be observed if there was wise planning; yet we are not without instances of a total omission of any such consideration in the planning of industrial towns within a generation in the United States.

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Just why a man with brains in his head, operating toward heaven instead of in the other direction, should in laying out a city in the wild, to be newly created, take full cognizance of the need for hospitals, jails, and cemeteries, and absolutely omit any definite attempt to reduce the demand upon them by a provision for parks, playgrounds, and parkways, I do not know.

All through this chapter I have spoken of the efficient use of recreational areas. Therefore, in now discussing the equipment for recreation outside of playgrounds, I must often refer to what has already been written. A horrible example may serve as a point from which to depart. In a certain mid-western city of less than a hundred thousand inhabitants there is a park of twenty-one acres, which costs just $21,000 a year to keep going. Its chief adornment is the superintendent's residence, which includes a curious assembling of all the architectural monstrosities that were known when it was built. There is a moth-eaten "Zoo," with some pathetically crowded animals still existing in it. There are some elaborate clipped flower-beds, including contortions in geometric form, and then there is a sleekly paved roadway leading to the one high spot in the little area, from which it is discovered, when one attempts to get a general view, that such possible view has been wholly shut out by planting especially designed for that purpose!

It may be said in reference to this dreadful park that it is absolutely useless for recreational purposes. It has not a restful inch in it. It has no provision for activities of any sort. It is simply a municipal mess, a civic travesty, a park inadequacy.

Now the same amount of money applied in another city over a larger area has provided such recreational facilities for an equivalent population as to bring about more than a million park visits in each year, and distinctly to improve public order and public health. The difference is in the

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ideal. It is this ideal I would urge upon city planners; namely, that recreation equipment shall be aimed for recreation, and not for decoration.

As to the cost of maintaining parks per acre, I may say that it varies so tremendously, by reason of the differing quality of maintenance, that any citation is useless. Whatever the proper recreational provision costs in any American community in the absence of misapplication of funds, it is cheap in comparison with what the definite result is sure to be. Speaking broadly, it ought to be expected that if the town or city under consideration is assessed at anything like an honest valuation of its property for tax purposes, a park appropriation of one-half mill on the assessment, or fifty cents on the thousand dollars, will be fairly adequate. There is considerable advantage in this form of maintenance financing, because it expands with the increasing wealth and population of the community. When arbitrary appropriations are made, park authorities are always forced to combat, sometimes to their despair, the ignorance of the financiers, who consider recreational provision as a luxury.

Reference has heretofore been made to Mr. George A. Parker's novel ideas. I wish to mention but one more, which it seems to me might very well be considered and carried out in connection with city planning of recreational facilities. Mr. Parker believes that a park system may be made self-sustaining if the city will undertake to invite the average recreational expenditure of two cents per hour of its inhabitants, for one hour a day.[1] He would do this by including the "movie" as well as the refectory within the park and playground activities, and he would also do other things that afford upbuilding recreation as a city function. He has figured that inasmuch as the city is of absolute re-

[1] "Can Public Parks of Cities be Made Self-Supporting?" Address to American Civic Association, Baltimore, 1912.

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sponsibility, can buy in the cheapest market on the best terms, and need not provide either a profit or any interest on its investments for civic service, it can do more for less money than is possible in any private provision. In fact, his plan seems to show that it is impossible to avoid a profit in conducting a city park, with an attempt to sell everything at cost and to furnish much service free.

In recreational consideration the question of concessions for the doing of things that need to be done for the public in parks will inevitably arise. In this case there is to be combated the bad American habit of being willing to shirk public duty for private advantage. The idea of the concessioner must be to give as little as he can for what he gets, whereas the proper idea of civic service is to give as much as possible for what is received. I wish, therefore, to go on record as being unalterably opposed to the granting of park concessions or any other concessions in connection with recreational facilities maintained or proposed by any organized community. The giving of such concessions is a combination of civic laziness, incapacity and maladministration. The magnificent recreational work of Chicago's South Park system above cited is the best example that service can be rendered properly to the people directly by recreational authorities, and not through the funnel of a man who in his own self-interest must pour out a profit.

This survey of recreation facilities in city planning is of value only, if at all, when considered in connection with the general ideal of community service. Government in American communities has too long been an irksome bother to be gotten through with in any way that would be passable. We have swung the pendulum of individualism so far from its opposite of paternalism that we have at times been unchristian in ideal, and certainly inefficient in fact. I hope, therefore, that whoever attempts a proper consideration of recreational facilities in city planning work will

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have before him an adequate ideal of service to the individual, to be as honestly and thoughtfully rendered as service is now rendered in many private agencies. Such service ought to give those who are concerned with it the greatest satisfaction, for it is life-saving, health-building, community-uplifting, and, putting it all in one word, absolutely Christian: "Inasmuch as ye have done it unto one of the least of these my brethren, ye have done it unto me."

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CHAPTER VIII

PARK SYSTEMS[1]

In the reservation of land for parks and other open spaces, it should be clearly understood that the end is not primarily to beautify nor to add a luxury to a city's possessions. On the contrary, it is the profoundly important matter of securing essential recreation for a city's population, and a reasonably high standard for property development. Without reservations for parks, playgrounds, etc., and the proper platting of streets and parkways, the more influential and independent citizens will go beyond the city's limits to pleasanter regions, where streets are laid at easy grades conforming to the topography, and where ample reservation of open spaces will secure the pleasant prospects appropriate to a region of homes.

These are facts which people in cities which have passed through the experience of park reservation have learned to appreciate. Park reservations serve distinctly practical purposes, providing refreshing opportunities for outdoor life, and an element of permanence to a neighborhood which serves to fix the real estate values. Owners facing a park know that the outlook is thus secured, and they build and settle with confidence.

The question may still be asked by some who have not followed the history of American parks, "Of what use are these parks? Why not continue the buildings of brick and

[1] This chapter is based partly upon the author's reports on the park systems for various American cities.

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stone over an unbroken area indefinitely, as the city develops?" The answer is that cities can never be wholesomely and economically built in this way. Especially in our rapidly growing American cities it is vitally necessary to recognize certain laws on which wholesome physical

A COMPARISON OF PARK ACHIEVEMENT

Table showing the approximate Nº of acres of developed park area supplied for each 1000 of population in typical American Cities, of varying size, age and geographical distribution.

City	1910 - Population	Nº of developed acres per 1000 inhabitants
MINNEAPOLIS	301,408	12 Acres
MADISON	25,531	10.5 Acres
KANSAS CITY	248,381	10 Acres
BOSTON *	1,500,000	8.4 Acres
NEW HAVEN	133,605	8.1 Acres
ST. PAUL	214,744	6.8 Acres
DENVER	213,381	4.7 Acres
BALTIMORE	558,485	4.3 Acres
SPOKANE	104,402	3.8 Acres
SEATTLE	237,194	3.3 Acres
CINCINNATI	363,591	2.7 Acres
BUFFALO	423,715	2.5 Acres
LOS ANGELES	400,000	0.5 Acre

* Metropolitan District

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development of the community depends, precisely as we recognize laws on which the physical development of the

A COMPARISON OF PARK ENDEAVORS[1]

The degree of earnestness with which various cities are seeking to accomplish park service. A uniform basis of comparison regardless of size, age or locality.
Table showing the approximate yearly park expenditure per 1000 of population in typical American Cities.

City	1910 - Population	Annual park expenditure per 1000 inhabitants
MINNEAPOLIS	301,408	$3115
SPOKANE	104,402	2157
CHICAGO	2,185,283	2090 ●
KANSAS CITY	248,381	1600
DENVER	213,381	1455
CLEVELAND	560,663	1432
BALTIMORE	558,485	1355
PORTLAND	207,214	1328
DETROIT	465,766	1277
SANFRANCISCO	416,912	1070
SEATTLE	237,194	1054
BOSTON *	1500,000	1016
DES MOINES	86,368	814
BUFFALO	423,715	793
LOSANGELES	400,000	500
	* Metropolitan District	● 3 Main systems only

individual depends. Never have cities failed to appreciate

[1] This chart and the one on the preceding page were prepared to provide a comparison of Los Angeles with other cities.

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the need for freedom and elbow room, for more direct contact with nature.

A certain ratio should be maintained between the population of a city and the area reserved for open spaces. As the city develops, it is a short-sighted policy that fails to maintain this ratio, one which leads eventually to low property valuation, if not to slum conditions, and to ill-favored succeeding generations. A certain complement of fresh air, of open space, of touch with nature, proves in the experience of cities vitally essential for wholesome development. Response to this need results in high grade improvements and in sound, unfluctuating values—two of the chief factors in civic wellbeing.

Every city worthy of the name has public parks of some sort, and they are now recognized as a necessity of city life, just as streets and water and schools are a necessity. They contribute to the pleasure and health of urban populations more than any other recreative feature, and furnish the most necessary and valuable antidote to the artificiality, confusion, and feverishness of life in cities. At the present time the value of parks and open spaces in towns and cities is very generally appreciated. It is recognized that such facilities as parks afford are not only desirable, but increasingly necessary; in fact, indispensable. In a vague way there is approval, too, of a large increase in both parks and playgrounds. But few even of the more intelligent communities appear yet to understand with any clearness that these open spaces in cities are of great variety; that they are, or should be, selected and developed by experts to serve essentially different purposes, and that the failure to appreciate this fact and to keep it constantly in mind leads to great waste and inefficiency in our public grounds.

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Principles in the Selection of Park Lands

There are a few principles in the selection of lands for parks, parkways, and playgrounds which are finding increasing acceptance by city authorities. Briefly stated, they are as follows:

1. To acquire those easily accessible small tracts in different parts of the city which may most cheaply be adapted to serve as local playgrounds, neighborhood or recreation centers.

2. To seek also some moderately large tracts, even though less accessible for the present generation, provided they are capable of conversion at relatively small cost, which will have the beauty of natural scenery.

3. To acquire property for large parks in advance of a general settlement of the neighborhood.

4. To select generally, but not always, lands which are not well adapted topographically for streets and buildings.

5. To distribute the parks and playgrounds over the city in such a way as to give the maximum of use to the people who will be called upon to pay for their acquisition, development, and maintenance.

Thus the establishment of a system of parks and pleasure grounds for a rapidly growing city is one of the most difficult and responsible duties that ever falls to a city government, involving as it does the expenditure of large sums of money, and the construction of many permanent works. The land selected should be accessible for all classes of citizens by walking, driving, riding, or by means of cars; adaptable in the greatest degree for the particular park purposes to be served; inexpensive, and, so far as practicable, located so as to disturb the natural growth of the city as little as possible.

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Classes of Parks

The term "parks" is used in a loose sense to cover all sorts of public grounds. City squares, commons, public gardens, playgrounds, neighborhood centers, parkways, large outlying reservations or forests, and parks proper—all are loosely termed "parks."

City squares, commons, and public gardens are usually of small size, and are to be found in the business as well as the residential sections of cities. Their practical functions are to furnish agreeable views for those passing by or through them, to provide a pleasant resting place for those who take the time to use them in this manner, and in some cases to afford an appropriate and agreeable foreground or approach to public or quasi-public buildings.

Playgrounds are essentially different from squares, and should be selected and designed primarily for play. For convenience, they are usually divided into three classes, those for little tots, those for children of the school age, and those for older boys and men, or for girls and women. In no other department of public recreation has there recently been such a great development. The Yearbook of the Playground Association of America shows that out of 1,050 cities and towns in the United States and Canada having a population of 5,000 or over, 342 maintain supervised playgrounds, and the actual number of playgrounds conducted in these cities is 2,402. Reliable figures showing the appropriation for playgrounds are incomplete, but the returns from about one-half of the cities show an expenditure in 1914 of over $5,000,000.

Parkways and boulevards are agreeable promenades in themselves, and serve usually as pleasant means of access to parks from the various parts of the city, or as connections from one park to another. A parkway is apt to in-

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clude more breadth of turf or ground planted with trees and shrubbery than a boulevard, giving it a more parklike character and inducing a less formal treatment of the roads, paths, and accessory features. Boulevards are usually arranged more formally, with straight rows of shade trees, and parallel ways for pedestrians and vehicles.

One of the chief features of a city park system is the large park, comprising from 200 to 1,000 acres or even more. Its main purpose is to place within the reach of the people of a city the enjoyment of such a measure as is practicable of pleasant, rural scenery. The justification of its size, interfering as it does with streets and other city development, is the necessity for spaciousness in the production of scenery that is broad and natural and beautiful. One of the chief problems of the landscape architect or park planner is to make these parks available and useful to great numbers of people without destroying the natural appearance of their scenery, the main purpose for which they have been created.

These various classes or types of outdoor recreation facilities may for the sake of convenience be divided into seven types, as follows:

1. School grounds.
2. Playgrounds for small children.
3. Playfields for baseball, etc.
4. Neighborhood parks.
5. Community parks.
6. Reservations or forests.
7. Parkways.

These types may again be divided into two more groups, the first four representing what may be termed scattered facilities, which are repeated throughout the city, and the last three connected facilities, which in a way serve the community as a whole, and which are linked up in such a way as to form a park system.

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These types of outdoor recreation facilities can be very profitably and economically interrelated as suggested in the following:

Type 1: Usually isolated, especially in older built up sections. Has a decided advantage in being adjacent to 2, 4, or 7, and can well be located sometimes at edge of 5 and 6.

Type 2: Often isolated, but can well be included in 1, 3, 4, and 7, or on residential side of 5 and 6.

Type 3: Occasionally isolated; gains by being adjacent to 7, and can be designed as part of 5 and 6.

Type 4: Usually isolated, but gains by being adjacent to 7.

Type 5: Independent, but should form a link in park system, being joined to other units by 7. If carefully designed, it may contain 1, 2, and 3.

Type 6: Independent and at a distance, but tied to system by 7. In rightly designed areas may contain 1, 2, and 3.

Type 7: Links in the general system. In the broader parts 1 and 2 can be included.

Park Systems

The conviction is steadily spreading in the United States that a city needs not only to provide itself with each class or type of recreation grounds, but that these grounds in their main or general features should be outlined, acquired, and developed as a *system*, each part having relation to every other part. Just as a city needs a street system, a school system, a water system, a drainage system, and systems to provide for its other municipal activities, so it needs a comprehensive, well-distributed, well-developed system of parks and pleasure grounds. As yet few Ameri-

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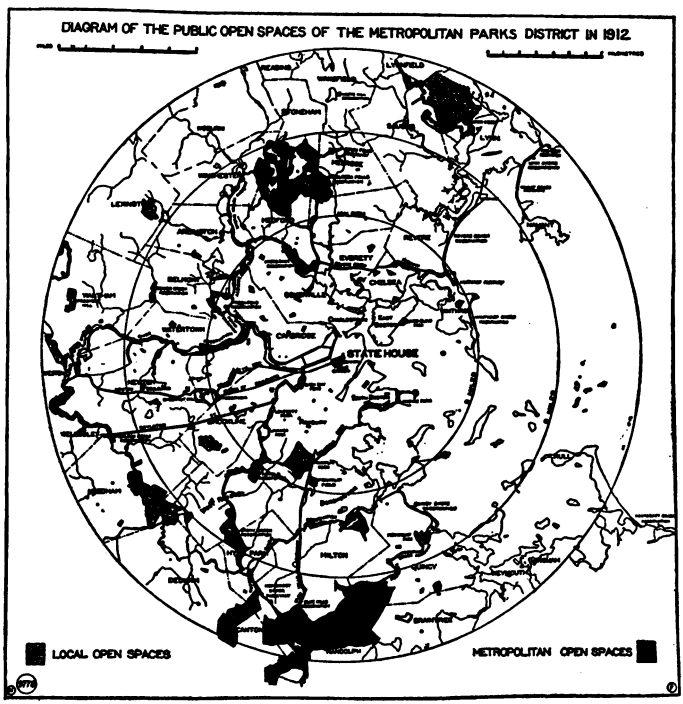
can cities have been able to secure a well-balanced park system. Some cities have a liberal provision of public squares but few playgrounds and parks and no parkways. Others have large parks and boulevards but no playgrounds, while still others have parks and boulevards and



playgrounds but few public squares. Many examples could be given of the unsatisfactory, incomplete, and one-sided way in which our so-called park systems have been developed. The public grounds of practically all of our cities have been selected and improved by isolated and desultory proceedings. The result in most cases has led to an unnecessary waste of money and opportunity. Hap-

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pily, there are exceptions. With the aid of expert advice, a few of the larger cities have worked out thoughtful and consistent plans, and in the Middle West even the small cities have conceived a system, and gradually, piece by piece, this system is being patiently acquired and executed.

The Justification of Parks

There are at least four important reasons to justify the early selection of park lands, and the development of a park system, by a growing city. In the first place, property is steadily increasing in value in such a city. It is not likely to be cheaper. It not only increases in value, but the construction of buildings upon it is apt to make its acquisition more difficult. Secondly, when park lands are once bought, they increase in value. All other public works depreciate; parks appreciate. The history of American park property enforces this point. Then, again, the experience of our cities shows that parks pay for themselves by making higher land values. One of the arguments which has most influenced real estate owners and tax payers generally is the direct effect of park acquisitions upon the value of city property, and, therefore, their indirect influence upon the city's income from the taxation of land.[1] Finally, a sound park policy, vigorously and consistently pushed by public authority, usually brings rich gifts from private individuals. The history of American city parks furnishes much encouraging evidence in support of this tendency. Cities that own few parks seldom receive gifts for park purposes. On the other hand, cities like Hartford, Conn., and Boston, Mass., that have long and

[1] For definite examples of financial results, *see* John Nolen: "General Plan of a Park and Playground System for New London, Conn.," pp. 28-41 (1913).

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honorable records in public park making, have an equally long and honorable record of private gifts for parks.

Methods of Payment for Park Lands

Park lands bought by a city may be paid for from annual taxation, by bond issues, by special assessment, or by the application of excess condemnation.

As a rule, except in the case of relatively small areas, it is better not to pay for park lands from annual taxation. They are purchased largely for the benefit of future generations, and unless they come under the special assessment plan, it seems more equitable to issue park bonds.

The financial problems connected with bonds issued for the acquisition of land and the planning of permanent improvements in parks have been well discussed in the valuable report of Olmsted Brothers to the Park Board of Portland, Oregon.[1] In that report the landscape architects write as follows:

A city having many or extensive opportunities for parks and parkways should promptly avail itself of them even at serious financial sacrifice. Such a city may wisely mortgage its future wealth much more heavily by the issue of long-term bonds for the acquirement and preservation of beautiful natural scenery than a city relatively devoid of such opportunities, provided there is a reasonable probability of attracting to itself thereby well-to-do and wealthy families, because such improvements tend to draw to the city wealth, the taxation of which may more than repay the city for the outlay. The same is true as to sections of a city having natural advantages for residences.

It is particularly urgent that a city having beautiful local scenery adapted for parks and parkways should secure the land betimes lest these natural advantages be destroyed or ir-

[1] See *Park and Cemetery*, Chicago, Ill., July, 1908.

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reparably injured by the owners. Many of the older cities would now pay very high prices for land covered with the primeval forest which the early inhabitants destroyed and which might once have been obtained for a few dollars an acre. Efforts are now being made in many cities to secure even narrow and unsatisfactory boulevards which might have cost nothing for land besides being wider and handsomer if those who originally determined the width of the principal streets had drawn the side lines twice as far apart. Even now, opportunities for widening, at very moderate cost, trunk thoroughfares outside the closely built area of most cities are being carelessly allowed to pass by. Unless parks properly distributed, located and bounded to best preserve beautiful local scenery and to accomplish the essential purposes they are designed for are secured while the land is comparatively unoccupied by expensive improvements, they rarely can be secured at all. To take an extreme case one has only to consider how utterly impossible it would now be for the city of New York to secure on Manhattan Island another such park as Central Park. But even if a sufficient area of land for a park should remain vacant near the heart of a city it is almost certain to rise to a value that is prohibitory, and this alone is a sufficient reason for taking parks betimes. There is still a large vacant area west of the Boston Park called The Fens, but whereas the land occupied by The Fens cost, twenty-six years ago, only 10 cents a square foot, or about $4,300 an acre, this vacant land adjoining it would doubtless cost now considerably more than $2.00 a square foot on an average, or over $86,000 an acre.

There is a very commendable disinclination on the part of legislatures to pass laws authorizing long-term municipal loans and in favor of keeping a comparatively low limit on the total amount which cities are allowed to borrow. But the case of loans for purchase of land, especially land for a park system, is very decidedly different from that of loans for most other municipal improvements. It is unwise for cities, as for business men and corporations, to borrow more than a safe fraction of their marketable assets, or so much that the in-

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terest and the annual sinking fund payments will be possibly greater than the sure income applicable to these purposes during periods of industrial depression. Still more fundamental is the principle that money should not be borrowed unless it can be profitably employed. In the case of money borrowed for the acquisition of park land it should be borne in mind that the land is an asset that will be worth more in almost every instance, by the time the loan becomes payable, than the amount of the loan. Moreover, as a general rule, the special increase in the assessor's valuations of adjoining private lands and in the improvements subsequently erected upon them, will yield increased taxes sufficient to meet the interest and the annual contributions to the sinking fund of the park-land loan. Of course there should be limitations, but experience indicates that the limits for park-land loans may safely be set very much higher than for other municipal loans. Examination of the facts by experts would be required, doubtless, to fully satisfy those in authority; but it requires very little knowledge of municipal finances to satisfy one of the general rule that parks are a better asset, when the loan by which they have been acquired becomes payable, than school buildings, fire engine houses, city halls, street improvements and most other things for which cities borrow money, and all of which deteriorate and some of which become almost valueless, even if they are not destroyed to make room for better structures.

There is a way, however, by which park improvements may be financed without having recourse to bond issues, and this is the scheme of benefit assessments. It is a plan by which the city secures a portion of the so-called unearned or collectively earned increment created by a park, and uses this to pay for the park in question. It accomplishes much the same result as excess condemnation, but in a simpler manner, and without the necessity for a large initial investment of public funds.

It has been proved in many towns and cities throughout the United States that the creation of a park causes an

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increase in the value of all real estate in the vicinity, an increase often considerably in excess of the cost of the park and its development. By the assessment system a portion of the values so created are surrendered by the property owners for the purchase of the park site and its improvement. In Denver, Indianapolis, and especially in Kansas City, Missouri, expensive park developments have been made possible by this method.

Kansas City's park achievement under the principle of special assessment is so remarkable that some account of it may prove of interest. In the early nineties certain men in Kansas City became impressed with the growth of the municipality and with the fact that the city had failed to make an adequate provision of park spaces for the people. An examination of the public property revealed the fact that the city owned in park lands less than one-tenth of an acre, this being a triangular remnant which some real estate dealer had donated to the municipality.

As a result of this investigation and awakening, Mayor Holmes appointed in March, 1892, a Park Board which at once went to work to study local conditions. In 1893 they published an extensive report setting forth the proposed improvements, and showing how they would be likely to affect the city's welfare. They found that the city was not only lacking in park lands, but also in power to borrow money, as the limit of indebtedness had been reached. Paradoxical as it may seem, to this discouraging state of the municipal credit is really due the possibility of Kansas City's splendid system of parks and boulevards, which has grown from nothing to 2,500 acres of parks and fifty miles of carefully improved boulevards and parkways virtually without increasing the public debt, although thirteen million dollars have been expended in the work.

The explanation is to be found in the scheme of special assessments against benefited property, which was devised

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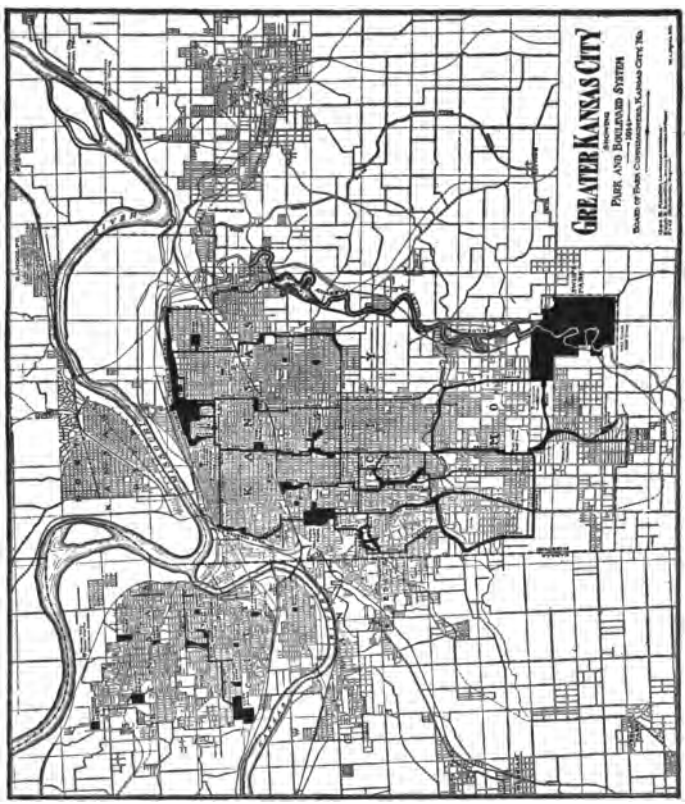

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and carried out as the logical method of paying for all park improvements. Around all proposed parks or boulevards, benefited districts were established. For the sake of convenience the city was divided into five park districts. The broad general principle applying, that those receiving the benefit should pay the cost, opposition to any particular improvement was not aroused in localities remote from the improvement.

The special form of benefit tax used for the building of the Kansas City system resulted in the sale of Park Fund Certificates, which were merely a collective expression of the separate assessments against the lands in the park districts, the city treasurer acting as trustee for their collection and disbursement, but which did not become obligations of the municipality and did not conflict with the limitation on the city's debt-making power. These certificates bore interest and were sold the same as bonds, the interest being six per cent. The demand for them proved to be greater than for ordinary municipal bonds, and the method devised out of the absence of city funds proved in the end to be a blessing.

One feature of the Kansas City boulevard work deserves special mention. Like nearly all western cities, most of the streets were platted with widths of from 50 to 60 feet. The landscape architect emphatically gave it as his opinion that no boulevard should be of less width than 100 feet with the added provision that, where car lines followed the boulevard, an extra width should be provided. The tendency of the Park Commission since that time has been to increase the minimum width to 110 feet. To pay for the property taken, a jury decided upon the district to be benefited, which in general included land for a block and a half on either side of the intended boulevard. Then the cost of improvement of the boulevard itself was charged against the abutting real estate, land values only. In all

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cases the broad general principle was applied that the property benefited should pay for the improvement.

The testimony is unanimous that the abutting property in all cases receives great increase in value from these park improvements. As an illustration, on the Benton Boulevard the average gain in value per front foot above all costs of construction was $26.50; on the Linwood Boulevard, $32; Gladstone, $41; and Harrison, $52.30. This shows an average gain in value of 325 per cent over the value of abutting real estate prior to the establishment of the boulevards. Thus has Kansas City secured one of the most splendid and adequate park systems in the United States, and, instead of being a burden in taxation, it has been without cost to the public treasury and has actually put money into the pockets of those who have paid the bills, simply because the resulting benefits in all cases exceeded the cost. The method here illustrated deserves consideration and adoption by other American cities.[1]

By statute or constitutional amendment, a number of states have been given the power of excess condemnation, and under this power it would be possible to acquire not only the land needed for parks, parkways, and open spaces, but land contiguous thereto. The constitutional amendment for New York State, adopted in November, 1913, is as follows:

> The legislature may authorize cities to take more land and property than is needed for actual construction in the laying out, widening, extending, or re-locating parks, public places, highways or streets; provided, however, that the additional land and property so authorized to be taken shall be no more than sufficient to form suitable building sites abutting on such park, public place, highway or street. After so much of the

[1] *See* George E. Kessler: "Actual Distribution of the Cost of Kansas City Parks and Boulevards," *Proceedings of the Fifth National Conference on City Planning,* Chicago, Ill., May 5-7, 1913.

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land and property has been appropriated for such park, public place, highway or street as is needed therefor, the remainder may be sold or leased.

While this power has existed in some states for years, it has not yet been used except in minor ways.

Parks and City Planning

One of the greatest influences now operating toward a better provision for parks and other recreation facilities in this country is city planning. The movement is spreading rapidly from town to town and from city to city. Its aims are many, but primarily it is an attempt to forecast and provide for the requirements of a city as a whole, and to anticipate by a reasonable period the improvements and developments which such a forecast shows to be desirable and in some form or other inevitable. City planning, therefore, is an effort to save waste—waste due to thoughtless delay, to haphazard procedure, and to ill-considered plans. When city planning is wise, it works in harmony with local conditions, takes account of topography, and responds to the peculiar commercial and economic needs of the locality. One of its dominant purposes always, however, is to promote, to extend, and to make more adequate and more perfect the provisions for public recreation.

To make parks effective, other factors of the city plan must be considered. The public works of a city are dependent one upon another. For example, it is nearly always desirable to reserve for park purposes the banks of the brooks, small rivers, and other non-navigable streams of a city, and to safeguard these channels from encroachment. This should not be done primarily because they usually afford one of the best opportunities for parks and parkways, but because they enable the community to pro-

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vide adequate channels for storm-water drainage. These are necessary for safety. Without such reservations, exceptional storms are almost certain to cause disastrous floods, as the history of American cities illustrates.[1] Another example of interrelation is the way in which the surroundings of parks influence the character of the parks themselves. Through selfishness or ignorance, the values of a city's investment in parks may be considerably reduced. Ugly poles and wires, preventable smoke, billboards, and other nuisances of this sort destroy the very values that parks are supposed to create, and should not, therefore, be permitted. Even the character of private buildings abutting on park property—stores, apartment houses, saloons, etc.—should be reasonably regulated. More important still are the facilities for reaching parks. Many cities have postponed the consideration of this point until proper provision was impossible, or, if not impossible, very expensive. Philadelphia is now constructing a parkway from the center of the city to Fairmount Park, its largest pleasure ground, at a cost of many million dollars.

The conclusions that this chapter aims to reach are that large towns and cities need not only to increase the number of their public grounds, but also to increase their variety. Moreover, these park properties should be selected with due consideration for other features of the city plan, and with regard to the various methods of payment that park benefits justify. More than an increase in expenditure, there must be a widening of aims, a finer discrimination, an expansion of the ideas of service, and a more accurate estimate of local conditions and local needs. The size, character, and location of sites for each particular purpose must be more carefully considered, as well as the nature of the design, and its faithful maintenance. Now is the time to turn active attention to these matters, for it

[1] *See* Chapter XI.

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is now that so many American cities are moving to increase the number of their exercise and pleasure grounds, and to secure the advantages of comprehensive city planning.

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CHAPTER IX

WATER SUPPLY AND THE CITY PLAN

This chapter will treat of the public water supply as related to the general city plan. It will be the endeavor to make it comprehensive, including the general subjects of quantity and quality, and in a brief manner to present the principal features that are comprised in the up-to-date water-works system, with special reference to their bearing on the city beautiful as well as utilitarian. Present day thought is rapidly assimilating the principle that utility and esthetics may well be combined, and that roughness of outline and carelessness in architectural proportion are not necessary adjuncts either of strength or of service. In other words, visible public works are incompletely constructed if there has been no endeavor to make them attractive as well as operative, and underground construction fails to meet the conception of the modern city plan unless careful thought has been taken to serve the convenience of the citizen as well as his necessities. Pleasing features in building and landscape are perfectly possible of attainment at reasonable cost. The constant tearing up of well-paved streets is a relic of a less civilized age, and ugly unkempt reservoir surroundings bespeak ignorance of up-to-date water works planning.

Objects of Water Supply

The beginnings of a water-supply system are found in the necessities and comfort of a community. Protection

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against fire is often the primary cause, or it may be that the needs of the present are what were the luxuries of a not distant past. Whichever it is, the demands for ever-increasing quantities of water must be recognized and met. The only proper and equitable method of selling and conserving water is by means of meters in connection with constant and efficient waste inspection of both interior plumbing and exterior piping systems. The amount of water unaccounted for is often from 25 per cent. to 50 per cent. and more of the total supplied, while with proper inspection it is often possible to reduce considerably even the lesser amount.

The legitimate demands for water are undoubtedly increasing. In 1895 Mr. Dexter Brackett reported that 100 gallons per capita was a proper basis for estimate of the amount of water to be provided for the Boston Metropolitan District. Although this district is now within the estimate, nevertheless it seems desirable, in making new installations, and in view of the greatly increased demands for all classes of service, to use 150 gallons per capita as a basis for computation. Domestic needs are rapidly increasing with larger and more modern plumbing installations. Manufacturers are more and more dependent on the city water to carry on important portions of their work. Fire departments and insurance companies are demanding that larger amounts be available and that they be under greater pressure. Public uses in buildings, street watering, and drinking and ornamental fountains cannot be curtailed if the best interests of the city are to be met.

Sources of Water Supply

The original source of all water supply is in the rainfall. The terrestrial supply may be drawn from the surface—

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lakes, rivers and impounding reservoirs—or from underground sources, comprising springs, wells of various kinds, and horizontal galleries. The character of the water depends largely on general conditions of topography, geology, and climate. The quality is mostly affected by local environment, and quickly reflects both natural and artificial conditions. Modern convenience requires running water at the tap under some pressure. In order to accomplish this, either the water must flow by gravity from some elevated source, be raised by pumping, or, perhaps, be supplied by a combination of these two methods. The two fundamental conditions of water supply are quantity and quality. With adequate quantity the problem of supply can be solved. Many cities have abundant supplies at the very thresholds of their doors, but are prevented from using them freely on account of the quality of the water. Upland surface waters from sparsely settled drainage areas in many parts of the country naturally furnish supplies of superior quality. When such supplies are unavailable, it is necessary to resort to artificial treatment, such as sedimentation, filtration, aëration, sterilization, and miscellaneous treatments in order to furnish water fit for potable purposes and at the same time without features disagreeable to sight, taste, or scent. To maintain a proper supply, storage facilities comprising more or less extensive reservoirs are required to meet fluctuations due to the varying rates of consumption, and to provide for the periods of greater or less length during which the source of supply may be inadequate.

Distribution System

To conduct the water to localities where it is required, it is necessary to provide pipe systems—supply mains connecting the reservoirs with the community, a distribution

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system for portioning out, and a service pipe system to care for individual needs. This whole plan may be likened somewhat to a tree—its roots the collecting reservoir, including the inflowing streams or the pumping installation; the trunk the principal supply main; the branches the distribution system; the leaf stems the service pipes; and the leaves themselves the places of consumption. The analogy fails, however, in that a water-works distribution system is ordinarily cross-connected in many diverse ways. The uses for which water is required determine to a large extent the character of the system. Usually one set of water pipes is sufficient, but conditions often arise to meet which dual systems are necessary. On account of inadequate supply, lack of proper pressure, or the expense of purified water, many cities are installing a separate system for fire protection purposes, and such a plan may easily adapt itself to providing a supply for commercial and manufacturing uses. A serious drawback to such an extension, however, is the danger from infectious diseases, due to illegal connections and the surreptitious use of polluted water by employees.

Water supply is utilitarian to the utmost, but, from the times of the old Roman aqueducts to the last word in present-day architecture, it is impressed upon us that service and beauty can be combined without sacrifice of either and without undue expense.

In order to state briefly, but in an orderly manner, some of the things that may be done to improve water works for the benefit of the city plan, a beginning will be made at the house, the leaf of the tree, and thence we will proceed downward to the storage reservoir, the root of the entire system.

Water departments should have some supervision over plumbing in houses, and the water should not be turned on until the company's inspector has certified to proper

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installation. Such regulations would prevent much needless waste of water due to inferior and improper fixtures. Whenever hot water boilers are installed, there should be some auxiliary tank service, either air pressure or gravity, to provide against danger in case of the shutdown of the water service. As an additional preventive of waste, a return system may be installed for the hot water plumbing, and self-closing fixtures should generally be required.

For service pipes connecting the house system with the street mains various materials are used. Careful thought should be given to the size and to the materials used in these connections so that they may be reasonably permanent, that the all too common practice of constantly ripping up pavements for repairs and reinstallations may be avoided as much as possible. The present practice in many cities of continually tinkering with service pipes is wasteful of money, destructive of pavements, and a nuisance and eyesore to the public. Galvanized iron is a common and inexpensive material. Much present-day pipe of this character is, however, short-lived, either on account of accumulation of rust or because of the destruction of the pipe itself. This condition is very often due to imperfections in the galvanizing coating on both inside and outside of the pipe. Lead and lead-lined pipes are very satisfactory if there are no substances in the water which will act on the lead and cause poisoning. Both iron and lead pipes are readily attacked by stray electric currents and, if so exposed, rapidly deteriorate. A very satisfactory and permanent service is found in the cement-lined pipe, if properly made and laid, and this pipe also has the advantage of low first cost. Brass pipes are excellent as far as permanency is concerned, but are rather too expensive for general use. In many localities, especially those where the ground is clay, loam, sand, or other material with few large boulders, it is usually possible to install service pipes with a minimum of trench ex-

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cavation by using a machine for pushing the pipe through the ground for quite long distances, and in the case of renewals or plugging, it is often less expensive to abandon the old pipe altogether and install a new one.

In all cases of extension of mains into new territory, it is well worth while to study local conditions to see if some plan cannot be worked out whereby service connections may be installed to the street line at the time the water main is laid, whether or not there are houses to be served. The pipes could be shut off at the main by means of the corporation cock now in almost universal use, and no leakage would then occur from the dead pipes if they were properly laid. To save digging up the street to get at the corporation cock, a service box can be placed over the cock with the cover at or just below the street surface.[1]

To an even greater extent than with service pipes, provision should be made to obviate the present all too frequent opening up of streets to repair or relay distribution mains. Pipes in the distribution system are ordinarily made of cast iron, and this is practically an indestructible material. If the system is properly planned, there should be no need, for many years, of replacing such pipe, provided the joints are properly made and care is taken in the laying of the pipe itself. The present method of laying pipes and then digging cross trenches the entire width of the street for laying service pipes is, to say the least, not conducive to smooth pavements for general traffic. It seems possible that in the up-to-date city-planning scheme such conditions can be avoided. For example, a city street plan very well thought of has main arteries radiating from a common center like the spokes of a wheel. Joining these spokes are broad avenues concentric to each other, and intersecting

[1] Alternative of laying main under sidewalk with subsidiary main at each block under opposite sidewalk. Has marked advantages where streets are fairly wide and lots narrow.

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these are numerous streets. In the main arteries are reserved areas either grassed or for horseback riding. In these can be placed the large supply mains, and when these are so located there is very little need of again opening up the trench. To care for the consumers there could be mains of comparatively small size on each side of the street. Perhaps it would be found advantageous to lay these mains under the sidewalks instead of in the roadway. There are many advantages that appear to accrue from such a plan—shorter service pipes; no necessity of opening up an improved roadway often paved with heavy concrete, and a duplicate set of mains for use in case of ordinary fires without passing hose lines across car tracks. For use in conflagrations, connections with the large mains would be provided. These smaller side mains would be connected to the radial mains at each intersection, and large mains for fire purposes would also be run in the concentric avenues. In short, the well-known gridiron system of piping would be carried out with the intention of providing two mains instead of one in the broad cross streets.

In the colder parts of the country the freezing of hydrants is a cause of annoyance and worry. All hydrants should be well drained to some permanent sewer or to some other place which will accommodate the water, otherwise considerable digging is necessary under very trying conditions. In brief, for both service pipes and distribution mains some system should be devised to obviate the continual excavation and reëxcavation of city streets to the annoyance of the public and the destruction of the roadbed.

Reservoirs

Elevated storage tanks are a necessary adjunct, and these can be made very attractive features of the landscape if

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some attention is given to architectural design. The masonry tower encasing the 300,000-gallon steel tank of the Metropolitan Water Works at Quincy, Mass., is an excellent example of such construction. The accompanying illustration shows a view of this tower in the background, overlooking the 5,000,000-gallon reservoir kept in reserve for emergency, the standpipe taking care of ordinary fluctuations in draft. This tower cost about $25,000, excluding the cost of the inner steel tank and its foundation. It is built of uncoursed quarry-faced Quincy granite with rough or fine pointed trimmings and six-cut work at windows. From the surface of the ground to the cap of the merlons this tower is 75 feet high. Between the inner surface of the stone work and the steel tank there is a space 3 feet and 3 inches wide in which is constructed a circular iron stairway to an observation platform at the top of the tower.

Much of the foregoing portion of this chapter has dealt with water-works construction from the viewpoint of preventing annoyance to the public and providing for the efficiency of the water-supply system of the well-planned city. Most effective work for the pleasure and recreation of the citizens can be done about the storage and impounding reservoirs. If this work is based on plans carefully thought out and executed, not only can a most attractive parkway be added to the assets of the city, but the cost of the care and upkeep can in a great measure be provided from the resources of the reservation itself. Under proper precautions, which may not in any way be irksome nor impede any reasonable liberty of visitors, the public can be freely admitted to water supply reservations. Water drawn from large impounding reservoirs with many weeks' or months' storage capacity is practically free from the risks of infection from pathogenic germs. Such germs do not propagate in stored water but lose their virulence and become destroyed within a short time, a condition

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RESERVOIR AND MASONRY WATER TOWER, FORBES HILL, QUINCY, MASS.

THE CRAIG GÔCH DAM, ELAN RIVER, WALES

New Works for the Water Supply of Birmingham, England. Note the Inviting Roads, Built Chiefly for the Pleasure of the Public

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radically different from that which obtains with water from a running stream taken directly for supply. The most advanced thought in public water-supply work is that all water used for potable purposes should be filtered. Without this precaution, however, and with only the safeguard of storage and sedimentation, many of the most important water-supply gathering grounds of the world are open to public use. Among these may be mentioned the Boston Metropolitan Water Works, the Croton Works of the city of New York, and Loch Katrine, the source of Glasgow's water supply.

In the case of an impounding reservoir the first requisite is usually the dam to close the valley outlet and permit of the storage of the drainage water from above. Whether this dam be of earth or masonry, there are methods of treatment that will either make it blend imperceptibly into the natural topography or else provide a structure whose very dissimilarity and bold features produce a work of architectural beauty well set in natural surroundings. An excellent example of such a structure is found in the Craig-Goch Dam on the Elan River, Wales.

Probably one of the best examples of simulation of nature's handiwork is the hill ridge built across the Chagres River at Panama and called the Gatun Dam. So like the neighboring hills is this great structure with its one and one-half mile length and half-mile width that visitors tramping its sides and top inquire when they will see the dam. Another example, perhaps more easily followed, is seen in the north and south dikes at the Wachusett Reservoir of the Boston Metropolitan District. Here large amounts of material stripped from the bottom and sides of the reservoir were to be disposed of, and double use was made of the necessity. The basin was thoroughly cleaned and the material, instead of being expensively dumped outside the area, was economically and attractively

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placed in a broad "plaza," serving the two-fold purpose of dam and spoil bank.

In the case of earth dams the downstream slopes should be made as flat as financial conditions will permit. Here there is opportunity for economical engineering construction combined with landscape effect. More often than not, and especially in low dams, it is possible to use a large amount of loamy materials obtained cheaply from nearby stripping. With a broad, thick dam constructed therefrom, a much cheaper and no less safe structure in many cases may be obtained than if the dam were built along time-honored lines with core wall and comparatively steep slopes.

Slopes steeper than one foot vertical to one and three-quarters horizontal are not practical for horse mowing. Comparatively wide berms, not over 30 feet apart, in vertical elevation, add to attractiveness and prevent the slopes from washing under heavy rains. Gate houses and intake towers should be given an architectural treatment suited to the surroundings. (See illustration.) Overflow channels are not less effective, and are much safer in regard to stability of embankments if the waters are made to fall over rocky ledges and through boulder-strewn channels. Straightway courses are desirable to take off the flood waters quickly, but by giving thought and study to details it is usually possible to accomplish a similar result along the curved and winding line of beauty. Often it happens that the head available from the reservoir is not necessary for water-supply purposes. Under some conditions this potential power may be developed into electricity and a source of revenue is thus obtained. Such use need in no way interfere with landscape architecture if only proper plans are drawn. In any event fountains may be maintained, serving the two-fold purpose of pleasing the eye and improving the water by aëration.

Marginal roads may well be laid out about the reservoirs,

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thus giving the public pleasant traveling facilities and at the same time allowing them freely to inspect the source of their water supply. It is well, however, to keep such roads several hundred feet back from the reservoir margins and generally to plant the intervening space with low, thickly growing shrubs. Evergreen varieties are to be preferred, both on account of the landscape effect and to avoid the annoyance of falling leaves. Such treatment allows of enjoyment of the scenic features and prevents dust from gathering too thickly into the reservoirs. Judicious oiling of roads accomplishes this end, also, in a very satisfactory manner, and if care is taken, no objectionable tastes or odors will appear in the water drawn in the city.

Excellent examples of combination of water-supply grounds and recreation areas attractively laid out are found within the Boston (Massachusetts) metropolitan district. As typifying natural development, Spot Pond may be taken as an example. The reservoir has an area of about 275 acres and lies almost in the center of the Metropolitan Park System on the north side of Boston. This area is easily reached by the steam trains or by several lines of electric cars which pass through it. The reservoir was originally a natural pond used by three nearby towns as a water supply. To form a storage basin in the northern part of the water district, its bottom was either entirely stripped of loam and peaty deposits or, if these proved too deep to be economically excavated, they were covered with clean gravel to a depth of twelve to eighteen inches. The level of the original pond was raised and considerable swampy flowage cut out, either by filling or by drainage diversion. The shores were stripped of all trees, brush, and objectionable matter to a point well above wave action and then riprapped with heavy stones from the bottom excavation. A comprehensive study of the entire area was made under the direction of competent landscape architects, who

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most satisfactorily blended landscape effect and water-works requirement. In the cutting and thinning above wave reach, especial care was taken to save large and prominent trees. Surplus material from the bottom excavation was so disposed of as to blend perfectly with natural topography, and such areas planted in quickly growing shrubs and trees in order to destroy so far as possible any appearance of the artificial. An island was constructed in the center of the pond, and with its rocky shores and heavy growth of evergreen trees is a prominent and pleasing feature. At well-chosen points clean gravel and sand beaches of very gradual slope were constructed. As one travels along the well-kept roads, now approaching the water's edge and now swinging further inland, suddenly out through a heavy growth of hemlocks and pines a sunlit beach flashes into sight, perhaps flanked on one side with water-worn or moss-grown boulders and on the other by a tangle of bushes kept just carefully enough not to show artificial care. This area is only five and one half miles from Boston, and thousands of people frequent the roads and woods on every pleasant summer day. The water from the reservoir is used for domestic supply without filtration, and the only protection found necessary is the supervision of the park police and signboards set in conspicuous places calling attention to the fact that the waters are used for domestic purposes and must not be defiled. Bathing, boating and fishing are strictly prohibited, but no restraint is put on other reasonable forms of recreation.

Distinctly opposite to this method of park treatment is the treatment of the reservoirs and grounds at Chestnut Hill, which are also about five miles from Boston and easily reached by electric cars. Here all is artificial, and the landscape gardener's art is shown to perfection. Smooth, well-built macadam roads wind along the margin of the reservoirs, following the perfect curves of the shore line.

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Dark Hollow Pond

Screen Chamber, Weston Reservoir

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Shrubs and trees of many varieties have been effectively placed, and are kept in perfect shape. The margin of the roadway toward the water is well turfed and kept as well trimmed as a golfing green. The shores themselves are paved with flat stones well laid and carefully kept free from grass and weeds. Looking eastward over the reservoirs the tops of the pumping stations appear. These, too, show the same intelligent treatment that characterizes this entire system and has made it an object of study and imitation for many other water-works systems.

In the planning of the reservoir proper, care must be exercised to design so that the conditions of the tributary watershed may be met. On the one hand, storage much in excess of the ordinary run-off, together with a considerable draft, results in long periods of bare shore and an accumulation of vegetation which will cause trouble later when the water rises. On the other hand, if the reservoir is too small to meet demands, it will be subject to extreme fluctuations between high and low water and areas of swamp or flat land will be uncovered which will encourage growths that may make the reservoir offensive. Large storage reservoirs have great advantages in the opportunities they provide, both from a sanitary standpoint in reducing bacteria, and from an esthetic standpoint in bleaching out colors. It is, however, proper to consider carefully the expense of construction for excess storage purposes.

For the improvement of the supply, swampy areas on the watershed should be drained, and certain swamp growths such as cedar, black alder, and similar trees may be advantageously cut out.

With the temperature of the water at about 70°, objectionable growths of blue-green algæ are almost sure to appear and cause very objectionable conditions of odor, taste, and appearance, due to the decomposition and disintegration of these microörganisms. The temperature of the

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water appears to have a controlling influence with reference to these growths. To avoid such conditions of temperature as much as possible, shallow flowage and landlocked pools of little depth should be avoided. Considerable expense may be undertaken for this purpose, which in the end may result in greatly decreased cost of filter maintenance.

For the protection of the supply from the drainage of thickly populated districts, the stream may be disinfected with chlorine gas or a similar sterilizing agent and, under some conditions, filter beds may be advantageously constructed.

In the treatment of shores and bottoms of reservoirs, there has been considerable discussion as to whether or not it is advisable to strip or to cover all organic matter in order to remove the food supply and so eliminate the trouble from organic growths. In the case of the Wachusett Reservoir and other Boston basins, the entire flooded area has been stripped, and the results have been very satisfactory, although expensive in first cost. The objectors to this plan claim that the benefits are not lasting, and that a more economical procedure is not prevention but cure of the infected waters by filtration. In the cases of the Ashokan and Kensico Reservoirs of the New York Water Supply, just constructed, the conclusion of the specialists called on this matter was that, while in the early years stripping of the sides and bottom had a tendency to guard against objectionable tastes and odors due to organisms, ultimately it made little difference. Due to their recommendations, the sides and bottoms of these reservoirs were not stripped. The entire question seems to be one for settlement in accord with local conditions and requirements.

In order to improve the appearance of reservoir shores and to avoid unsightly matter floating in the water, it is, under any condition of treatment, best to remove all trees, brush, fences, and other light objects from the entire area

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to be flooded. Around the shore and within the limits of fluctuation of the reservoir, and for from three to five feet above this point, all stumps should be removed, and all large roots and other vegetable matter cleared up and burned. Subsequent wave action will erode the soil on the slopes and result in creating sandy and gravelly shores similar to those found on natural ponds.

Forestry

In the case of water-collecting areas a treatment may be given, not less in keeping with conditions to be desired but utilitarian in its results, and thus attractive to water-department managers. The matter of forestry and the wood lot may now be considered, and, with proper supervision, this feature of corporation enterprise may result in very welcome profits.

Forests about water-supply basins are not only a source of pleasure for visitors, but their presence instinctively gives a feeling of confidence and security to those who use the water. Who does not unconsciously prefer the water of a lake hidden away in the hills and surrounded by evergreen trees to that drawn from a river draining a thickly settled community? Although it may be known that in the latter instance the water is absolutely sterile and devoid of harmful germs, due to filtration and sterilization, still the woodsy water is preferred, even at the risk of a typhoid carrier on the watershed. Sentiment and psychology have great influence over all animals, the human not the least. Not only must the water supply be free from all pollution, but it must be above suspicion, and suspicion is easily influenced by appearance.

Public water-supply areas are especially adaptable to forestry undertaking. Unlike lands in private ownership,

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no limit is placed on the time of production, nor is immediate income return a prime factor. The first requisite is the protection and improvement of the gathering basins, and the fact that there is a sure return is a powerful lever to move an otherwise often unappreciative political commission. The automobile and the more humble trolley car have annihilated space, and shaded walks and wooded drives once a day's journey away and seldom visited are now within easy reach and eagerly availed of by the tax-paying public. But these forested areas are more than parks and pleasure grounds; they are recognized income producers, and many water works, both publicly and privately managed, have taken this matter up in earnest. The State Forester of Massachusetts has completed a working plan for the city of Fall River for a municipal forest of three thousand acres. In his report on this matter, he indicates a net return on the investment of seven and one half per cent. The city of Hartford, Conn., has nearly four thousand acres under scientific planting in worn-out farms and denuded forest areas. The New Haven (Conn.) Water Co., a privately owned corporation, has entered upon this work to an even greater extent. The Massachusetts Metropolitan Water Board has extensive plantations and forestry preserves about its Wachusett Reservoir. In the West, the city of Seattle is planning works of similar character on a very large scale. These are only a few of the water departments that have recognized the value and desirability of forestry work. In the Old World many towns and cities have their own municipal forests from which yearly a very handsome profit accrues. Municipal water commissions are very fortunately situated in this respect, as they have no taxes to pay, the ownership is everlasting, the element of time exists only in a slight degree, and the land, purchased for the protection of the water supply, has no cost to charge off against the forest.

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In other words, every dollar received from the forest products is clear gain.

In the past ten years the Metropolitan Water Board of Massachusetts has planted 1,500,000 white pine and spruce seedlings on 1,313 acres of land in the vicinity of the Wachusett Reservoir, at an average cost of $20 per acre, and in addition has spent $6 per acre per year for improvement cutting. It is stated by foresters that average land planted to pine will yield 46,500 feet per acre in 50 years, worth on the stump at present prices $465, with a cost for planting, care, and maintenance, during this period, of $170.

Arbor vitæ trees, on account of their dense growth, are excellent for planting along reservoir shores to keep leaves and other objectionable material from being blown into the water by the wind. They may be spaced 3 feet apart in narrow rows about 25 feet back from the shore line, and when properly placed for landscape effect form a very attractive feature. It is well that these trees reach considerable size before transplanting, otherwise they are very liable to die. The cutting of trees and brush which interfere with the growth of young pines costs from $6 to $7 per acre. Improvement thinnings in 20- to 30-year-old pines and chestnuts cost about $25 to $30 per acre. From this source salable wood may be obtained, but usually not of sufficient value wholly to pay for the work. The cost of removing trees from the nursery and planting them averages from $5 to $5.50 per 1,000 trees, or $5.75 to $6.50 per acre. On watersheds where the planting will not average more than 25 or 30 acres per year it is seldom profitable to undertake special nursery work. Young trees can be purchased very reasonably from the regular nurseries, and are usually better grown. Among the trees best adapted for use in reservoir forestry work in the East are the pines —white, red, and Scotch—arbor vitæ, spruce—white, Norway, and Douglas—birch, hemlock, larch, and tamarack for

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the softer woods. For the deciduous trees there are maples, walnut, oak, ash, and locust. Spruce and pine usually make the most satisfactory plantings. Red pine is especially good in that it is not attacked by the pine tree weevil, and its matured wood is about as valuable as white pine. As soon as meadows are abandoned for the production of hay, they should be planted, all hedge rows and standing trees being first removed. Three-year-old transplants set at 6-foot intervals are suitable for this. These plants may be set with a mattock or else in plowed furrows. The cost, exclusive of the stock, will average from $4 to $5.50 per 1,000 trees, or say about $6 per acre. The stock itself should not cost over $5 or $6 per 1,000.

In the case of plantations, all failed spaces of one year should be filled in during the next season. All overwood of any kind that interferes with development should be cut and removed. This is especially necessary with old apple trees and other short-boled, broad-crowned trees that may have been left standing.

In forestry work pure and simple, without regard to park effect, it is unnecessary and undesirable to clear out underbrush and fallen trees in older stands. In areas where the chestnut blight has appeared the only remedy is to cut. When chestnut exceeds 60 per cent., the entire tract should be cleared of all trees and replanted. When the proportion is less than 60 per cent., the chestnut trees should be cut out and the remainder left to form the future forest. If the timber left will not form a suitable stand, it may be underplanted with pine or spruce.

It is impracticable in forestry, as in other things worth while, to expect something for nothing, and in order to get results work must be done and attention given, although high-priced specialists are not required except at rare intervals for consultation. Tree pests and forest fires must be guarded against and eliminated if a foothold is to be gained.

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Spraying, manual destruction, and tree cutting are the most efficient methods applicable in the former case. Fire lines, efficient patrol, and ready access to simple tools are the most operative in the latter.

"Do your work with what materials you have at hand," said a most capable park superintendent, and his parks are among the most celebrated in the country. It is neither necessary nor desirable to import either labor or materials. Use for this work the laborers who are engaged in pipe-laying during the summer. They probably are not the most skilled in this particular class of work, and the cost of their product will not compare with that of skilled choppers. On the other hand, remember that the forest has cost little or nothing to develop, and that by its means a force skilled and trained in the real business of the water department is being held together. As for materials, make bridges and culverts either of field stone with rustic effect, or of rough-hewn timber which the nearby forest will furnish. A few large boulders, moss-grown and weatherworn, advantageously placed are most attractive features. Vistas properly cut from vantage points on hill roads are a most pleasing relief after a long drive through the woods. Well placed clumps of evergreen trees on bold headlands jutting out into the lake are a source of great pleasure.

Finally it must be borne constantly in mind that a water supply for human consumption is being cared for, and on its purity and freedom from pollution rests the safety of the whole city. Nevertheless, it is also to be remembered that strength, utility, and beauty reach their highest development only in combination.

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CHAPTER X

NON-NAVIGABLE WATERS

The succeeding chapter will show that the development of the navigable waters of a thriving city is generally brought about directly by the demands of shipping and trade. These demands are usually as obvious and tangible as the monetary prizes which are sought by commerce and business, and, under these stimuli, the development of waterways, docks and dock connections naturally keeps pace in an automatic way with the enterprises and resources of a city.

On the other hand, the development of the non-navigable waters of a city is generally forced upon the community *indirectly* by the reactions of destruction and neglect. The gradual melting away of natural beauty, the insidious creeping in of ugliness and squalor, and a high death rate along shore, force cities to grapple with the problems of non-navigable waters as real issues—issues as important as ships, commerce, and industrial wealth. Cities have rarely discovered these automatic reactions until business prosperity has been established. The rude awakenings of ugliness, deformity, disease, crime, and death then give justification enough for the construction of waterside embankments, walls, roads, recreation grounds, boulevards, parks, and other related improvements which might otherwise be regarded as mere luxuries dependent upon esthetic whim for their existence and for their design. In a thriving city, therefore, the improvement of non-navigable waters

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must be *made* to keep pace with growth and with enlightenment.

The Camp versus the City

The earth and the primitive man are ready-made for each other. To the needs of the family, the camp, or village, land and water lend themselves—not in small measure or grudgingly, but with largeness and welcome. Nature is kind to small colonies of men provided they make little change in their surroundings, but when devastation or pollution assumes proportions large enough to upset a nice balance, Nature retaliates by killing men wholesale with parasites which multiply through men's careless ways of living. Nature has other punishments in store—floods, droughts, erosion, deposition of silt, changing heights of ground water—which she visits upon colonies of men when they tamper with rainfall, with stream channels, with forest cover, and with other great elementals. She is ready to relent when men learn their dynamic lessons. In the end, she becomes kind and docile even with that most terrible aggregate—the city of millions—when men adapt their ways to hers. These enormous congregations of men are terrible, first because they make sweeping changes in the face of the earth, and second, because they possess tremendous potential powers of self-destruction. In temperate climates and upon a convex topography of gentle slope and with light soil, cities may grow with least risk and consequently with least cost; but in sultry airs, upon concave ground of heavy soil, cities grow with constant menace to themselves and at great cost for self-preservation. A high-ground water level is menacing and therefore expensive. Sad to say, small lakes, ponds, little rivers, brooks, shallows, flats, and beaches are a menace and a source of great expense to cities. So great, however, is the scenic

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and recreative value of such "non-navigable waters" that a city is poor which does not possess them, and a city which does not safeguard them and fit them for use is not modern in the best sense.

All inland waters, tidal creeks, flats and the seashore were clean and fine to behold before men congregated upon them. Myriads of fishes, molluscs, water-loving animals, and plants throve in them and upon their margins without hurting the water or its shores. Man was the defiler and the destroyer. His encampments, villages, and cities clouded or blackened the water, burdened the shores with trampled mud, rubbish, and filth, and killed the animals and plants. Waters and shores which were sought at first by strong or wealthy men for their freshness, beauty, and resources, were at last shunned by all but the poorest or weakest of men who were obliged to put up with filth, ugliness, sterility, and the disease and death that went along with them.

The problem which confronts us in cities is to prevent men from polluting the pure rain water and pure sea water as they meet it in the hollows and grooves of the land, and to prevent them from treading and tearing to pièces the soft edges of strands and banks, and from clogging and defiling shores, shallows, and marshes.

Soft Earth Shores and Marshes

In nature, soft shores of peat and fine earth resist the wave and current action of water by virtue of the vegetable fibers of grasses, sedges, and roots which bind particle to particle. Erosion takes away no faster than deposition replaces. Eel-grasses and other bottom vegetation in some measure prevent the drift and erosion of soft stream beds and shallows. The pollution of water by cities, however,

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upsets this natural balance by weakening or killing the vegetation, and permitting fine particles to wash away in the current or to slide down into the stream bottom. Wear and tear of the feet of men and domestic animals upon soft earth shores and shallows hastens the erosion by breaking the bond of vegetable fibers. The elimination of poisons of all kinds from waters which wash vegetation-bound shores is essential to their stability. So difficult, however, is the prevention of pollution, and so sensitive are soft shores to erosion, that most cities blanket them with bulkheads, ripraps, or walls.

An attempt was made a few years ago to create and to maintain a tidal marsh on the especially prepared and carefully leveled soft earth of the Back Bay Fens, one of the Boston parks. For a time the shores and the marsh sod resisted the waves and weather successfully, but the poisons of sewage, a change from salt to fresh water, and a slight change in the height of the water, killed large areas of grasses and produced mud patches and exposed sliding, glistening, eroded muddy banks. Grasses and other vegetation which have been established for many years at a certain height of ground water are very sensitive to permanent changes of water level. They will endure occasional severe floods and brief droughts, but a change of level covering a period of years is usually fatal and brings in a new type of vegetation adapted to the new water-level condition. While one type is dying and a new one is coming in many years may elapse with unsightly appearances. The sensitiveness of plants to changes in the salinity of water is also marked if the change covers long periods. Many grasses which thrive in brackish water will die in fresh water or in salt water. With proper care, this experiment would have succeeded, but the project was abandoned, and the marshes have been filled high enough to bear upland grass and to serve as firm, dry ground for athletic fields,

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Since tidal marshes are built by floating particles deposited at extreme high tide, they become automatic catchers of floating refuse. Unless properly drained by ditching, the pools of the marsh become breeding places for mosquitoes. In general, the city and the marsh cannot be reconciled to one another except in parks. There is no denying the beauty and impressiveness of great marshes, yet, as a whole, cities have found them hostile to comfort, health, and economic use without reclamation by filling or diking. But to abandon and caseharden the soft edges of all waters to make them man-proof would be an act of vandalism. A city which does not possess liberal reaches of soft shore with its characteristic vegetation of rushes, grasses, shrubbery, and trees is poor indeed.

Rock Shores

Rock-bound shores will endure the polluted water of cities, but the rockweeds and animal life of the shore vanish with the taint of poisonous waters and sewage. Artificial shore treatments of large stones and boulders (grouted with gravel) are often applied to soft earth shores which have been robbed of their natural vegetable bonding of grass, thatch, and roots, to enable them to endure the wear and tear of waves, weather, and feet, and yet at the same time give chance for vegetation in the stone crannies. Artificial shores of stone, unless foundationed, are liable to settle into the soft matrix. Rugged rock shores are automatic rubbish catchers. Smooth, hard-looking, paved shores or concrete shores will endure all plagues, but in naturalistic surroundings they are apt to be offensively discordant in appearance. In canals, regular channels, basins, or other artificial formal constructions, the use of such materials is appropriate and often necessary.

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Shores can be protected in large measure from the landward side against petty injury by the construction of border roads. These roads ensure proper policing and at the same time afford frontages for houses facing upon the water rather than backing upon it. A species of "neutral ground" is created in this way which is of inestimable value to waterside parks and to private property adjoining them. These principles are well illustrated by conditions at a peninsula in one of the mill ponds belonging to the Draper Manufacturing Company at Hopedale, Mass. The construction of the marginal road automatically prevented the erection of outbuildings, shacks, and the formation of ash dumps on the edges of the river, and made possible the construction of a pleasing group of workmen's homes. Marginal roads of this kind, whether in modest surroundings, as in the example just mentioned, or in great works like the embankments of the Seine or the Arno, are first essentials; they give access both to the hinterland and the river border in a way to assist the development of each, and in a way to permit the public to enjoy shores without trespass upon adjoining private land.

Beaches of Shingle, Pebble, and Sand

Great beaches are of inestimable recreative value to the city. With proper care, their natural slopes and materials need not be changed to adapt them to use by hosts of pleasure seekers. These shores must be as carefully protected from breaches, spit building, and other major deformation as from flotsam and jetsam. Many a beach has been lost by the construction of piers, jetties, breakwaters, and sea walls, which have modified the direction or the materials of alongshore drift. The removal of cobbles from a sand beach often leads to extensive inroads of

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water and radical changes of curve and slope. So sensitive is the beach to topographical changes along shore that the greatest pains must be taken to forecast the result of such changes before they are made.

But the greatest changes and injuries which threaten the beaches near great cities are wrought on shore above the water line by the lovers of the shore. Tents, shelters, shanties, booths, cottages, pavilions, and hotels crowd the water front and reach out upon the water itself. Paths and roads wind about as best they may on the shoreward side of these structures. At last the shore is completely usurped, and the beach may be seen only from the windows or verandas of the more fortunately situated dwellings, and may be visited only by sufferance of trespass by those who crowd its water line. Finally, the public, in desperation, flings back these man-made barriers, makes them toe a restriction line, builds adequate roads and paths, and finally restores the beach to the man on foot and provides him with bathing facilities and police protection. Revere Beach at Boston has already lived through all the stages of this history, and Coney Island, New York, is now living through such a transition. The crowded, dangerous, and unsightly condition of Revere Beach in 1895 led to its acquisition by the state. The beach railroad was moved several hundred feet landward and on its site was constructed a boulevard open to the sea. Hundreds of houses were torn down to accomplish this improvement. New houses, hotels, and restaurants have sprung up in orderly array on the landward side of the boulevard, and a handsome and commodious state bathhouse, connected with the beach by means of a subway under the street, has been built.

Further north on this Atlantic shore, at Lynn, the natural sea beach is backed by a sea wall to give support to a driveway and promenade upon a coastal beach which was naturally high and abrupt. Houses had encroached upon

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this beach to such a degree that space for a thoroughfare could only be secured by terracing and walls. The undermining of these walls by the sea is now in progress owing to tide movements and drift which were aggravated by the walls. Students of sea wall construction should study the history of the great wall destroyed by spray, waves, and currents, at the Lake Shore Drive, Chicago.

Sewage Elimination

Sewage should be kept out of sluggish or standing waters, evanescent streams, and tidal shallows. If it cannot be kept out, then these waters must be made to run rapidly (if the volume is large) by constricting the cross section of the channel, by providing a channel with smooth, clean sides and bottom (see illustration), by gradient improvements, or by tapping new streams to flush old channels. Evanescent and diminutive streams, if they are to carry sewage, must be kept under cover in pipes or conduits. Tidal shallows and standing water bearing sewage must be freed of sewage or else reclaimed. At the Charles River Basin (illustration facing page 214), a marginal intercepting sewer was provided to receive the numerous private drains and street sewers which formerly had their outfall into the river, and at low tide upon the flats. Sewage-bearing streams which are subject to flood are especially menacing.

Floods

Abnormal tidal floods, augmented by wind and rain, must be met by dikes or dams planned (as at Galveston) to prevent inundation, or the low ground subject to flow must be raised above flood level (low ground of most seaboard

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cities). River floods should be stopped by preventing too rapid a run-off of rain or melting snow, by the provision of flood storage basins, by deep, ample channels of well-modulated gradient,[1] or, if possible, by shunting off a portion of the watershed.

In planning a city it is of the utmost importance to calculate systematically the size of channels required to carry off the maximum expectable storm-water floods, especially in brooks and small rivers, and to safeguard these channels from encroachments. The watershed area of each stream must be measured on accurate maps or on the ground, the records of precipitation over a long term of years must be studied, and the capacity of the stream valleys to carry their heaviest floods must be calculated upon flat as well as upon steep gradients. With these data in hand, the designer is in a position to safeguard the city against flood damage, first, by arranging roads and building sites out of harm's way on natural contours above the natural flood line or on fills above the flood line natural or artificial; second, by preventing unexpected and undesirable ponding of flood water by bridge abutments, culvert abutments, road embankments, buildings, and other structures acting as local dams; and, third, by arranging dikes, open channels, or conduits to protect low land naturally subject to floods. Failure to study the local history of streams and to arrange the city to cope with expectable floods, especially those occurring periodically after the lapse of many years, has resulted in enormous property damage and loss of life. Cherry Creek at Denver, Stony Brook at Boston, and Bear Grass Creek at Louisville are familiar examples of this kind. The potential dangers of these streams could be guessed by very little study, but their docility at years of usual rainfall was so convincing to the average mind that the cities grew up about them. Roads, culverts, streets, and houses sprang

[1] *See* Engineers' Report on Flood Channels for Louisville, Ky.

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up in zones which were full of danger and rendered them still more hazardous by constricting the throats of the valleys. Even after disastrous floods had occurred, the cities were loath to believe that the inundations were liable to occur again, that they could be prevented, or that the cost of prevention could be afforded by the tax payers. Careful planning has now given these cities surety of safety, but the cost of these improvements, though great, has been much less than the flood damages sustained for want of foresight in the original plans for the cities.

For want of foresight in the planning of Erie, Pennsylvania, that city suffered heavy loss of life and property damage from a flood two decades ago. Although the inundation was predictable and a recurrence of the disaster was sure to take place, the city allowed twenty years to pass without taking adequate steps to safeguard itself. The relation of Erie to the topography of its site and of its environs was such that, with a sufficiently heavy downpour of rain, the city could not fail to be automatically flooded. In August of this year (1915) the mechanical couple has been completed again by an unexpected but predictable deluge of rain, and Erie has become, as a matter of course, the victim of another disaster. A lethargy in cities which permits them to become a prey to periodic disasters of this kind is slowly thrown off; centuries were needed for Florence, Paris, and Rome to awaken to the tasks of replanning themselves to withstand their river floods. In modern times, however, no thriving community can long tolerate delay in applying well-known principles of flood control to city planning.

Wholesale deforestation is sometimes followed by river floods, abnormal erosion, abnormal deposits of silt and scour, followed by abnormal low water. If river floods cannot be stopped, a city subject to them must be built to en-

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dure them. Streets, sewers, foundations, walls and floors should be arranged to withstand inundation.[1]

Normal Tides

Natural tides of the ocean which vary from a few inches or a few feet to many feet are as old as the world itself, consequently the shores they wash are perfectly adapted to them; erosion, shore-slipping and inundation of upland, have long ago ceased. Such tides are predictable and they can be met in a scientific way. Cities which attempt to creep out upon tide shallows must build dikes, or they must fill. The temptations to gain territory from the ocean in this way are so great, and the rewards are so satisfactory, that large areas of many cities upon a low seaboard are of this origin. The accompanying plan of the city of Boston shows the ancient and the present water lines, and indicates the enormous territory taken from the marshes and shallow tide water which embraced the ancient peninsula. Frequently dams are needed at the mouths of rivers to prevent their stream beds from exposure at low water, and to prevent the erosion of artificial banks and light ripraps.

The Charles River Basin includes a tidal area measuring about two miles long and averaging one half mile wide. It lies in the heart of the Metropolitan District of Boston, a community having over one million inhabitants. Before improvement, the natural flats of the Basin, burdened with the flotsam and jetsam of the city, and of the upper towns of the Charles River, were exposed to view at each low tide. Sea walls protected the soft shores from erosion, and at the same time prevented floating rubbish from stranding. Wholesale reclamations of the shores had been made in

[1] *See* U. S. Government Reports on the Mississippi and other river valley improvements.

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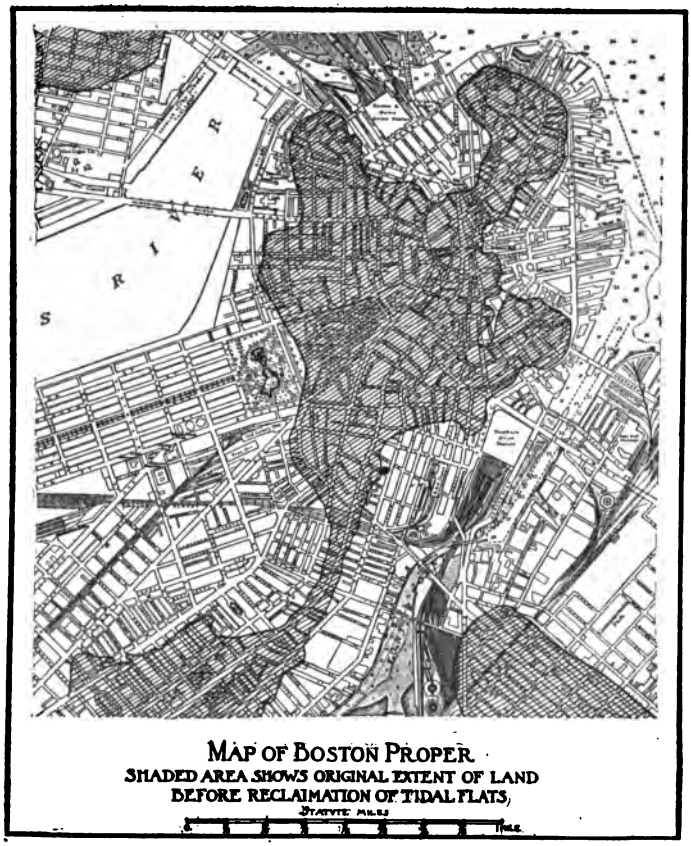
the extensive filling of the Back Bay, but the government engineers were not willing to allow the Basin to be reclaimed as a whole for fear that a reduction of the volume of tidal



flow would reduce the drag and scour in the harbor and tend to fix deposits of silt, thereby impeding navigation.

After years of discussion, during which the use of the Charles by ships and barges declined, permission from

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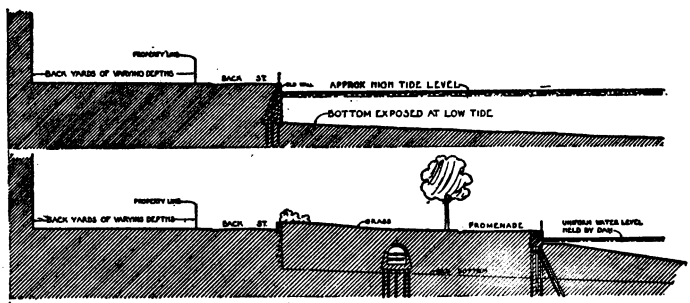
Washington to erect a dam to keep the Basin at a uniform level was secured. Strangely enough, strong protests were then made against this improvement by the residents of the Back Bay, who feared a change from salt to fresh water, and a change of ground-water level. Careful reports upon the proposed changes were made by special commissions, and at last public sentiment carried the work of improving the Basin to completion. The result has been satisfactory in all respects. Boston now possesses one of the finest "water parks" in the country. Partly to accommodate a



CHARLES RIVER BASIN ~ BOSTON
TYPICAL SECTIONS ~ SOUTH BANK
BEFORE AND AFTER IMPROVEMENT

capacious marginal conduit, and in part to secure a promenade, the southerly side of the Basin was embanked by filling as shown in the illustrations. All sewers and drains which formerly emptied into the Basin, were intercepted by a conduit, which prevents the contamination of the still water. Without sewage elimination of this kind, a great public nuisance would have been created by ponding the waters of the Charles. The cost of the work was divided among the municipalities involved, and betterments were assessed by tax increase. Property has increased markedly in value. Above the Basin, in Cambridge, Brighton, and Watertown, the water is now held at about the old normal

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high-water mark, and the rainfall is sufficient to keep the river full at all seasons. In these upper districts the shores are not protected with sea walls; the natural shores, eroded by the former tidal action to an angle of repose and a proper hardness, resist the action of waves raised by wind and by motor boats. Shore vegetation of grasses which throve in the brackish waters and which bound the soft edges of the meadows with their roots is gradually giving way to fresh-water vegetation which will serve the same purpose. In Hamburg, Germany, extensive use is made of grasses, waterside vegetation, and wattles to protect from wave-cutting the edges of the canals leading into the Alster Basin. This basin is arranged with naturalistic shores unlike those in the lower Charles River Basin. A saving in cost of construction can be made by using naturalistic stone paving or boulder work to take the place of masonry walls, thus eliminating piles, foundations, and cut stone. In Boston the traditions of the lower Charles favored vertical sea walls which reclaimed a maximum amount of land, no space being lost in slopes, and which collected no floating rubbish. So much wall of this kind had been built on the northern side of the Basin when the dam was installed, that a similar wall on the southern side was inevitable.

Ponded estuaries are liable to dangerous floods when a heavy run-off meets a spring tide. To guard against these conditions, the extreme high tides must be kept out, and the normal level of the ponded area must be lower than the usual high tide to give a storage prism. A problem of this kind well solved after years of procrastination and after many destructive floods may be studied in a tributary of the Charles—Stony Brook—which issued through the Fens into the Basin in the old days of tidal flow. In the Fens the banks of this brook were built with high sides and the water was received at last in a great meadow also enclosed with embankments. In seasons of flood, this meadow

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CHARLES RIVER BASIN, BOSTON, BEFORE IMPROVEMENT, SHOWING WATER AT LEVEL OF LOW TIDE

CHARLES RIVER BASIN AFTER IMPROVEMENT, SHOWING WATER AT PERMANENT HIGH LEVEL

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was inundated, and the waters were stored until an outflow could be secured at low tide. Tide gates kept the tide water out of the storage basin at all seasons.

Pleasure boating is handicapped and often rendered dangerous by low water in tidal streams and by swift tide eddies. The ponding of such streams renders them practically still, and they become ideal waters for boating and in cold climates for skating.

The Service of Parks

Problems of non-navigable waters within park boundaries can be solved most satisfactorily: parks provide space permitting shore improvements to be effected on liberal lines; parks may permit the removal of piers, wharves, bulkheads, buildings, property lines, rights of way, and other encumbrances which interfere with comprehensive improvements; parks accelerate shore improvements by combining them with road-extension projects or with park and traffic thoroughfares; parks justify longshore improvements for recreative reasons. In parks the public will not tolerate abuses or nuisances that would be accepted or ignored upon the same ground when privately owned; parks increase the value of abutting private land and assist the financing of improvements. The experience and the powers and organization of park boards make them ready executors of waterside improvements which can be combined with park construction or which can be construed to relate to park affairs. Duties of this kind assumed by park authorities may obviate the need of special legislation, prevent a duplication of commissions, and remove sources of friction, expense, and delay.

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Examples of Shore Protection Involving Navigable Waters

The embankments of the Thames at London are classic examples of the reclamation of soft, muddy shores. These embankments should be studied with those of the Seine, the Alster, the Tiber, and the Rhine, to compare ingenious methods of handling the local difficulties of a common problem.[1]

The Thames Embankments, including the Victoria, Albert, and the Chelsea Embankments, have reclaimed over fifty acres of muddy river banks in the heart of the city. They are nearly four miles in length. The Victoria Embankment at its normal breadth is 100 feet wide, which includes a 65-foot roadway, and two paths, one of 20 feet on the riverside and one of 16 feet on the landward side. Plane trees are planted about 25 feet apart on each side of the carriageway. At Westminster and Blackfriars bridges the carriageway rises to a height of 20 feet above high water, but between the bridges it falls to within 4 feet of the river. This change in level is taken up at the lamp piers which separate the several levels of horizontal panels of balustrade and parapet wall.

Disagreeable optical effects are sometimes noticeable on embankments of this type (note the Albert Embankment), where the traveled ways ramp up and down between bridges, where the bridges themselves have a pronounced camber, where the retaining and parapet sea walls are sloped back with a pronounced batter, where the foot promenades slope downward toward the hinterland, and where the

[1] Photographs of important waterside improvements in this country and in Europe, such as those at New York, Montreal, Chicago, London, Paris, Hamburg, Budapest, and Venice, are in such wide circulation and so readily brought to mind that reproductions of them are omitted from this chapter.

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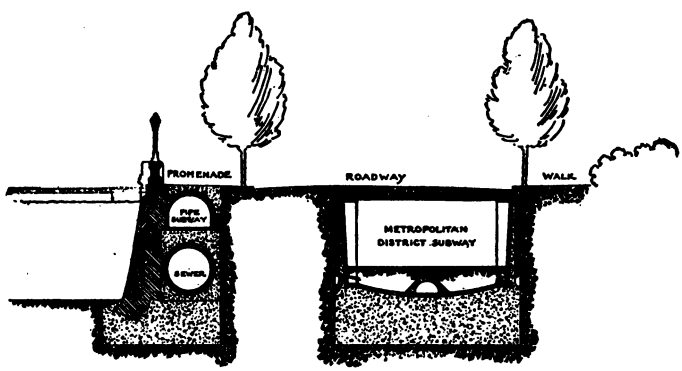
immediate hinterland slopes downward toward the water. The slight departure from true vertical and true horizontal in extensive flat surfaces of these kinds sometimes produces upon the observer a sense of confusion as to the true horizon. A low-level intercepting sewer is arranged in the Thames Embankment backfill, and space is provided, also, for a pipe conduit above it. Adjoining them is a subway under the whole length of the embankment for the Underground Metropolitan Railway. Re-



SECTION-VICTORIA EMBANKMENT-THAMES.

cessed stairways are built into the face of the wall to give access to floating landings for small craft and to wooden inclines which lead to the floating pontoon passenger stations of the Thames steamboat service. These landings rise and fall with the tide. Great pains were taken on the southerly embankment to prevent the sanitary and esthetic improvement of the river shores from interfering with the landward industries. To accommodate these, docks were built behind the roadway and connected with the river by canals having sufficient headroom to accommodate the flat barges of the Thames, which are designed to pass under low bridges.

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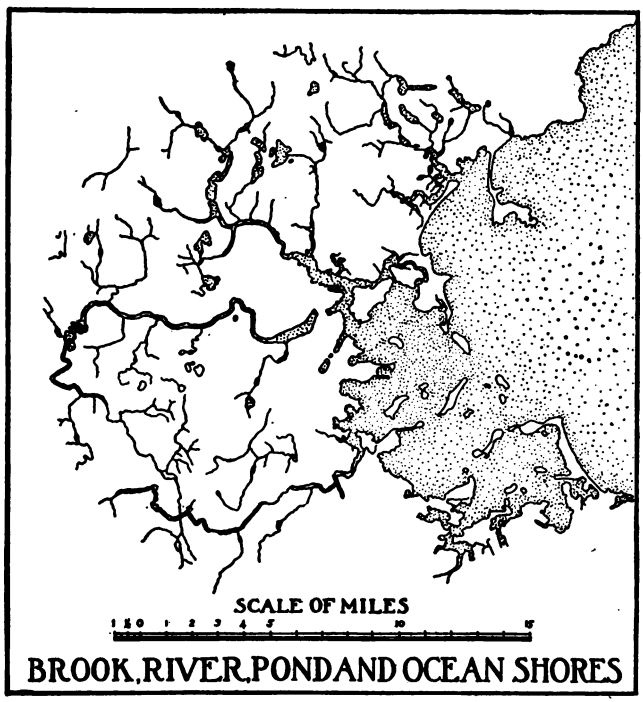
At Antwerp, near the great docks, the river-shore problem is approached from an opposite point of view—shipping, railroad yards, sheds, and a continuous bulkhead are the controlling factors, and recreation a minor one. To accommodate sightseers, an elevated platform of structural



Boston Metropolitan District

steel was built above the roofs of the sheds and near the traveling cranes of the bulkheads to permit pedestrians to enjoy a view of the river and its shipping, and at the same time to view the loading and unloading of ships and the interesting maneuvers of great dock machinery.

At Meintz on the Rhine, the public is allowed to enjoy

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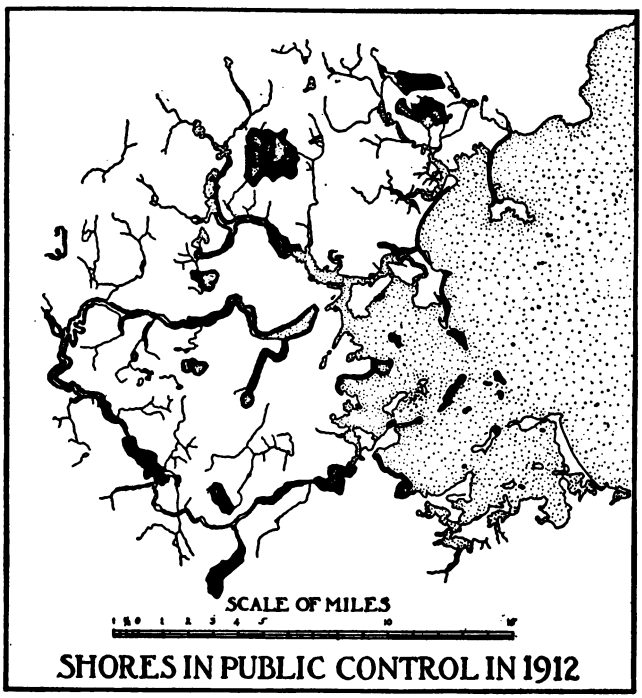
a sight of the river from a special promenade midway between two traffic streets. Locust trees of very small size, placed only twelve feet apart, shade this promenade without cutting off a view of the river and its interesting shipping as seen from the upper road.



BOSTON METROPOLITAN DISTRICT

Other European examples might be cited, but the limits of this chapter are too short to include them. The student should visit these great works to see and to measure. In America the field of study is small, but it grows in importance each year, and maps, photographs, and reports are easily secured.

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The metropolitan district of Boston offers a remarkable field for the study of non-navigable waters. The illustrations on pages 218 and 219 show the great extent of these waters and suggest the wide range of topography embraced by the watersheds of the Charles, Neponset and Mystic Rivers. This territory is occupied by thirty cities and towns whose comfort and sanitation largely depend upon these waters. To what extent this great community has already withdrawn the shores of rivers, ponds, and the ocean from private ownership in order to safeguard them by public control is indicated in the same illustration. As time goes on, additional shores must be taken; radical enlargement of the scheme will be necessary as the ground is more fully developed. The present takings, which are already large in extent, give some hint of the developments which will be required during the next century. At the present time, examples of all well-known types of shore occupation and shore development can be found in the Boston district. Frequent references to these works are made in this chapter in the hope that students of these problems will visit Boston and go over the district in detail, having in hand the numerous available public documents describing these projects.

Boathouses, Bridges, Playgrounds, Harbor Islands

Boathouses and other necessary waterside structures should be placed where they will present the least obstruction to views and to the use of promenades and driveways. Unless buildings of this kind are frankly intended to dominate a shore composition, they should be studied for a compact arrangement, a low roof line, and a modest color, and their site should be as retired as possible. The approaches to such buildings from the water should be planned to avoid interference with vehicular or foot circulation. To avoid

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GENEVA, SWITZERLAND, SHOWING BOATHOUSES, BREAKWATER, PIERS AND PROMENADES

BEAVER BROOK, WORCESTER, MASS., SHOWING IMPROVED CHANNEL

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conflicts of this kind, bathhouses, boathouses, sanitaries, and private lockers are often placed *under* shore embankments. Structures too large or too important to be housed beneath ground in this way are often connected with the water by well-lighted underground subways like those at Revere Beach, Boston, described elsewhere in this chapter. Trees must be regarded as obstructors of views as well as furnishers of shade. If large trees are objectionable, they may be kept within bounds by clipping, or trees of small habit may be chosen. Electric-light poles, signboards, band-stands, refreshment booths, and similar structures also interfere with views and with traffic circulation, and should be placed with this fact in mind. In choosing moorings for floating bathhouses, depth of water, velocity of current, ease of approach, appearance from water and shore, and interference with boating courses should be considered. The illustrations of the shores of the city of Geneva, Switzerland, show floating bathhouses, floating landings, boat havens, boat liveries, promenades and other well-arranged shore features.

Where bridges occur, their abutments must be placed high enough above the water to allow sufficient headroom beneath the ends of the bridge for petty longshore traffic. The profiles of the longshore roads must, of course, approach these abutments on an easy gradient, preferably not exceeding three per cent. Where traffic is intense, a separation of grades at bridge abutments through by-passes is desirable both for vehicular and foot travel. Between bridges, the longshore walls or embankments may rise or fall as topography, water levels, or convenience may require.

Monotony of appearance and barrenness of interest are much more likely to be found on shores having a constant water level and little shipping, like the Charles River and the Alster Basin, than on shores like those of the Seine in

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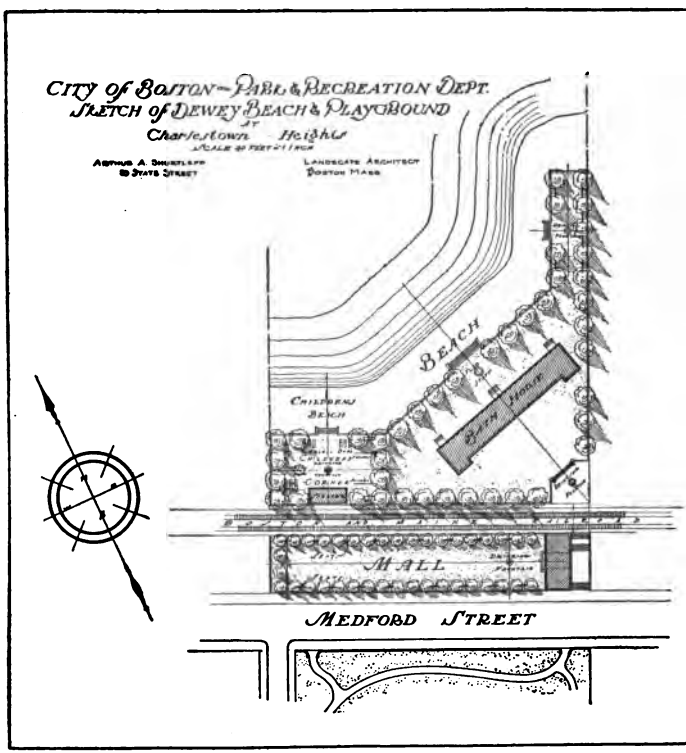
Paris, where a wide variation in water level occurs, and where important river traffic must be carried on hand in hand with the recreative uses of the banks. The small, puzzling details as well as the great problems of a shore improvement should be welcomed by the designer. He



should realize that character, interest of treatment, and service can best be secured by following the lead of local traditions and local needs. Insipid, stereotyped, and tiresome results are bound to be created unless the designer vitalizes his plans by keeping close to great matter-of-fact requirements and by giving patient attention to details.

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At Dewey Beach, a harbor bathing beach, playground and recreation area at Charlestown district, Boston, a bath-house and locker building dominate the water front and control the design of the promenade, approaches, and the small playground for little children. The great cost of land and its value for shipping led the city to make the playground as compact as possible. Wharves were torn down to give room for this little waterside park. In the Italian quarter of Boston a gravel and sand bathing beach may be seen on the harbor front at the North End Bathing-Beach. Bath-houses for women, with a small playground for little children, occupy one end of the back shore, and bathhouses for men, a ball field, and handball courts occupy the remainder of the high ground. A double-decked recreation pier embraces the harbor side. To make room for this important recreation area, several wharves were torn down.

An interesting transformation of the ancient harbor fortification of Boston Harbor, Governor's Island (100 acres), is now being made by the Boston Park Department to create a "water park" with extensive recreation grounds, promenades, and groves overlooking the ship channel and anchorage basins. Great pains are taken to preserve the old earth works, bomb proofs, drill grounds, and the citadel in adapting them to the new uses of the island. A plan is shown on page 224.

Recreation Piers

New York offers the largest field for the study of recreation piers. A popular two-decked pier with a sloping roof may be seen at East Twenty-fourth Street. This pier is 775 feet long and 55 feet (inside) wide. It is controlled by the Dock Department (1902) and was designed in 1897, being the first built in New York. Seats are provided for 2,600 persons, but over 15,000 are sometimes present at the regular evening band concerts. Other more recent recrea-

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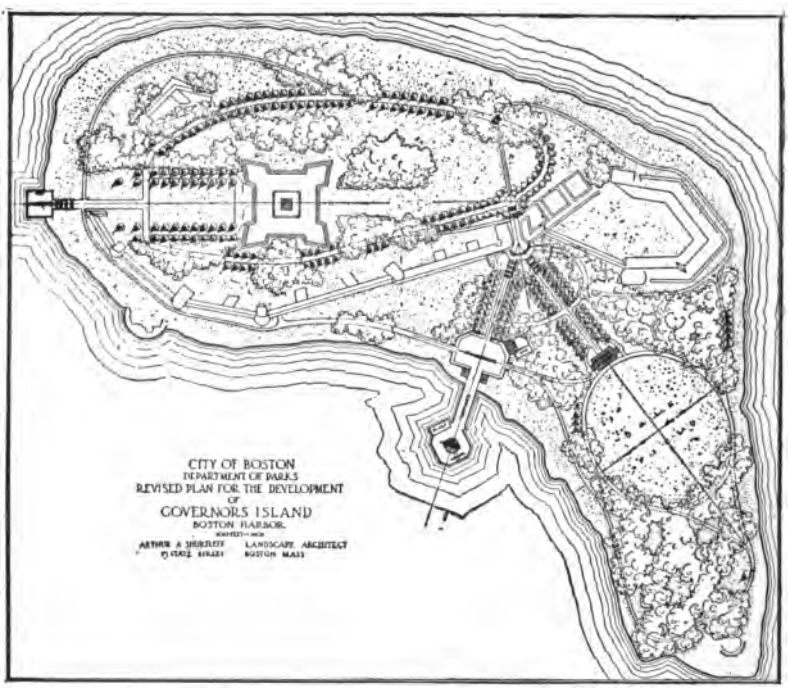
tion piers may be seen at Third Street, East Side; Fiftieth Street, North River; 129th Street, North River; and Barrow Street near Christopher Street, North River. The recreation piers of New York take the place of waterside playgrounds where land is so valuable for commercial pur-



poses that an area of ground equivalent to the several decks of the piers could not be afforded. Public landings are frequently arranged in combination with piers of this kind.

Conclusion

From the foregoing the reader has seen that the topic of this chapter, though superficially sounded, rests on a

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foundation of realities and necessities. It touches matters affecting the structure and the texture of the earth itself as well as human industries and the humanities. The redesigning of water shores to fit them for the use of cities is neither like the arranging of stage scenery, though a setting is prepared for the most vital aspects of city life, nor is it like the planning of hydraulic works, though it has much to do with water confined or free in rivers, canals, lakes, and the sea. Evidently the test of a successful design of this kind cannot be measured by its appeal to one type of man or to one profession, but to all kinds of men—boatmen, truckmen, engineers, architects, landscape architects, painters, social workers.

Works of this kind, useful in service and fine to behold, are created by steadfast devotion to the solution of practical problems. Beauty in this field, as in most others, results from perfect adaptation of means to ends, and it is wiser for a city to approach beauty by way of utility than to aim directly at fine appearances and miss the great end of efficient service.

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CHAPTER XI

NAVIGABLE WATERS[1]

Many different kinds of classification may be employed in analyzing navigable waterways. They may be classified as wide or narrow; lined with piers and slips or with bulkheads; subject to extreme variations in level or to small changes only; lined with wet basins or double level structures, where range is wide; bordered by uplands which are commercial or industrial, residential, or park; bordered by uplands which are flat and marshy or steep and bluff-like; used primarily for commerce or for pleasure craft; lined with structures designed to accommodate transfer between ocean craft and other water craft or ocean craft and trunk line railroads; lined with dry docks and associated structures, railroad yards, warehouses, ore docks, coal pockets, grain elevators, and other special commodity-handling facilities, or industrial plants; provided with such adjuncts of navigation as breakwaters, buoys, or lighthouses; lined with structures which are municipally or privately owned, revenue producers or not.

This apparently random list of classes is seen to comprise divisions of the subject which can be grouped—general topics, such as ownership and revenue production, and

[1] Much of the material in this chapter is taken from reports upon the harbors of Portland, Oregon, and Los Angeles, California, which matter was prepared for the harbor commissions of those ports by the author as their consulting engineer.

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specific physical items, such as breakwaters, warehouses and railroad yards. Among the specific items, three districts may be differentiated—the waterway, the hinterland, and the border zone. In the following discussion of the subject, the general matter will be postponed until after the special items have been treated, and a division will be made of the latter so as to group the details according to the three districts mentioned. The border zone or marginal strip will be understood to include all the structures from the edge of the fairway or clear water area to the edge of the zone of those land structures (located back a hundred feet or more from the water) which are not intimately related to the use of the waterway.

The Waterway

The navigable waters of the United States are such as are navigable in fact (16 U. S. app. 152), and which by themselves, or in connection with other waters, form a continuous channel for commerce with foreign countries or among the States (109 U. S. 385; 11 Wall. 411).[1] In England, waters are theoretically navigable if they rise and fall with the tide, the public having the rights of fishing and navigation, but the crown reserving ownership of the bed; in practice, however, all the more important rivers are entirely open to the public.[2]

Among the several lines of analysis mentioned, the most obvious is the division of the waterways into those which may be described as wide and as narrow. The former comprise the large lakes, the ocean with its wide straits, large bays, and other branches, broad rivers and, in general, all those waters on the borders of which vessels can be

[1] Bouvier's "Law Dictionary," Rawle's revision, vol. ii, p. 471.
[2] Funk & Wagnalls' "New Standard Dictionary."

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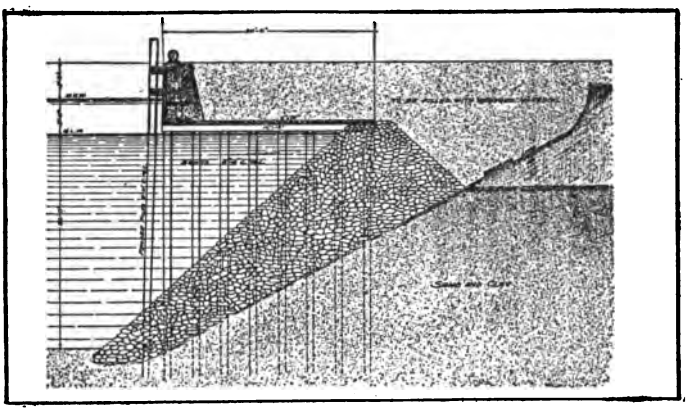
moored adjacent to proper structures erected at right angles to the shore line, and where there is sufficient space for vessels to turn, when entering or leaving their berths, without blocking all other shipping. Narrow waterways consist of canals, canalized rivers, and some exceedingly narrow branches of the ocean. The pier and slip type of con-



TYPICAL CROSS-SECTION OF BULKHEAD, NEWARK, NEW JERSEY

struction is normally found upon wide waterways, while the bulkhead type must necessarily be employed upon narrow ones. With a narrow waterway, because of the size of modern craft, it is usually impossible to project piers at right angles to the shore whenever it is deemed necessary to increase the available berthing space in front of a given length of water frontage. Vessels must needs then tie up against a bulkhead structure built substantially parallel with the waterway. Even in the lower Hudson River, with its width of practically a mile, the modern Atlantic liners interfere seriously with other navigation whenever they enter or leave the berths which have been provided for them at right angles to the shore front, and it would be actually dangerous to have two large vessels leave simul-

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taneously from opposite sides of the river. In a lesser degree this condition holds with reference to all narrow waterways, so that the usual type of structure to be found, in Cologne, Germany, or Portland, Oregon, for example, is one of the so-called bulkhead type built parallel with the stream. Where the waterway is wide, piers can be projected into it.

Obviously, it would be difficult for a vessel to leave a slip located at right angles to the shore front if the width of fairway in the clear between ends of piers on opposite sides of the river was equal only to the length of the vessel. Some narrow waterways exist in which this width is only once or twice the length of the largest vessel, but three times or more is highly advantageous, and four should be adopted as a minimum in most instances. In some locations it is found advantageous to design one side of the waterway with a pier and slip type of construction while the opposite side is designed with bulkheads. Occasionally the piers and slips have been constructed at an angle with the shore front where the waterway was narrow or where a current existed which might inconvenience vessels endeavoring to enter slips at right angles to the line of current. While the angular location was used to considerable extent at one time, the disadvantages from difficulty of approach from the acute angle direction, both by land and by water, some slight extra cost of construction, and waste room, at both inner and outer ends of pier sheds, have led to the use of the right angle location in most modern ports. For somewhat the same reasons the older, irregularly laid out structures which had grown in a haphazard manner have been found disadvantageous, so that the newer parts of such ports as Hamburg, Antwerp, and Baltimore are being constructed with long parallel slips and piers. The latter port is noteworthy because of the fact that the authorities are deliberately dredging out old irregular struc-

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tures and substituting in their place larger piers parallel with one another, so designed as to afford easy access from both the land and water sides.

Three or four times the length of the largest vessel which will probably navigate a given waterway has been given as the most advantageous width whenever vessels must turn and enter slips built at right angles to the shore. Where vessels tie up against bulkheads built parallel with the shore line, no such width is necessary, of course. In this case allowance must be made for the vessel to tie against the bulkhead and, possibly, also, to accommodate a line of river or canal craft both inside and outside the vessel when so moored. Room should also be available for vessels to pass with ample clearance in the remainder of the waterway. This means that between bulkhead structures a width of about eight times that of the normal vessel should be maintained as the total space available, and that a width of four times the normal vessel beam should always be maintained in the fairway.

The old English definition of a "navigable waterway" involves the idea of tidal changes of water surface. This conception probably occurs in English law and not in practice as exemplified by the quotation from the American authority, because the range of tides around the British Isles is much greater than is usual on the shores of the waterways of the United States. In fact, there is no true tidal fluctuation on the Great Lakes upon which a very great proportion of the total tonnage of the United States commerce is to be found. In this same conception must be included the changes in level of navigable rivers due to floods. Manifestly this range of water surface will dictate a corresponding type of water-front structure to accommodate both water carriers and shore use to the varying water-level conditions.

The commonest European solution of this question is by

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the device of a wet basin, so-called. A large area is separated from the ocean by a gate, so that the range of water level inside the basin is not affected by the tides on the outside; communication between the inside and the outside taking place only during the relatively short periods when the waters' surfaces are practically at the same level. This intercommunication usually occurs at mean tide, since twice as many occasions are thereby offered as when high or low tide level is selected for the level at which the basin waters are to be maintained. In this country, even where extreme changes of surface take place (such as the northern ports on the oceans and most of the ports on rivers subject to flood), the problem has been solved by the construction of high level or sometimes double level bulkhead or pier structures, the lower level submerged at certain times. The double level structure is found to some extent throughout Europe, but the wet-basin type has not been used in this country. Examples of such basins in Europe are found at Liverpool, London, Havre, Amsterdam, etc., while the American practice at ports with extreme tidal range is exemplified in the case of Montreal and Halifax. Somewhat the same type of bulkhead must be employed where there is a long-time wide periodic flood range such as occurs on the Ohio, Mississippi and Columbia Rivers. An example of a carefully devised scheme for such conditions is to be found at Portland, Oregon, on a branch of the Columbia, where both high single level and also double level structures exist.

Whether the waterway is to be used for commercial or pleasure craft or a combination of the two, determines such items as depth and width of channels, and the existence of certain special structures. In cases of almost exclusive pleasure use, race courses may be laid out, bathing beaches arranged, and provision made for landing places for small motor and sail pleasure craft, together with all the other

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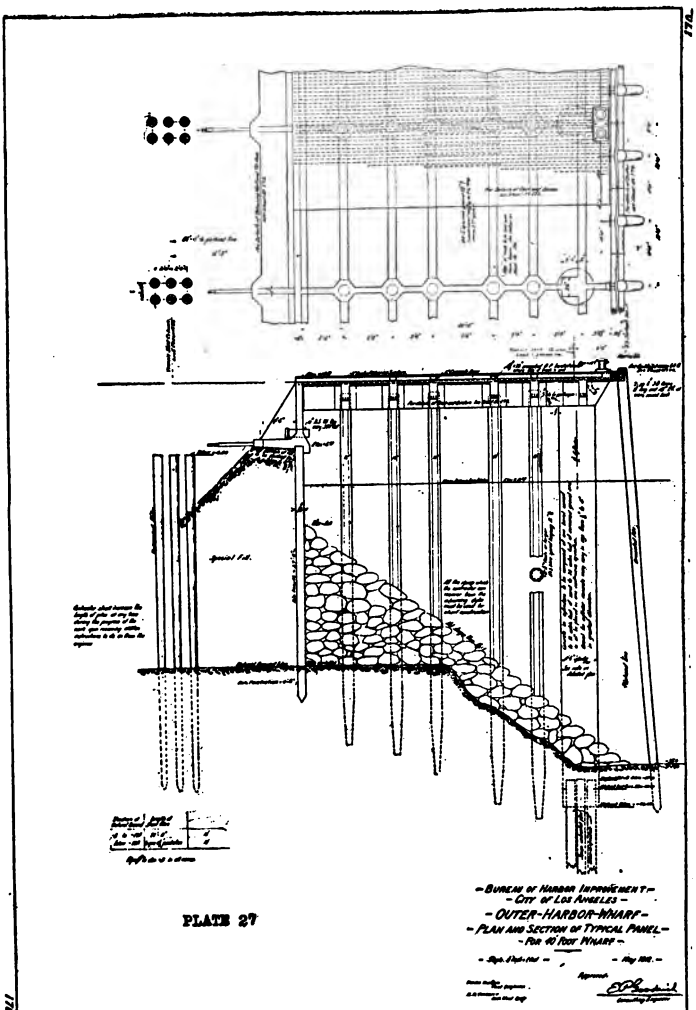

PLATE 27

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incidents of modern water recreation. Proper protecting structures, such as breakwaters, lighthouses, and buoys, and other channel indicators must be constructed, and these several features differ to some extent, depending on the depth and use of the waterway.

The correct location and design of breakwaters form a problem, the solution of which can create and maintain an artificial port where nature has not been generous. Failure, on the other hand, to provide such protection as is afforded by a well-designed breakwater has been known to give a port such a reputation that shipowners and captains were forced to shun it. The careful laying out, maintenance, and buoying of channels is of almost equal importance, and in some instances taxes the ingenuity of engineering skill to the utmost. The constantly shifting channels in the great inland rivers are well-known phenomena, and the necessity of ignoring natural channels to a large extent, sometimes creating channels for themselves, is said to have dictated the design of the shallow-draft, stern-wheel Mississippi River boat.

Lighthouses, smaller beacons, lighted buoys, fog horns, sirens, and other safety devices must be considered in connection with water-front developments of any magnitude, and there is ample opportunity for the city planner to combine the latest scientific development with a treatment which is pleasing to the eye of the artist and satisfactory to the layman. Anchorage grounds must be provided wherever fleets need to be thus accommodated, and in some instances mooring dolphins are found advantageous, at which vessels can tie whenever the major part of their cargo is to be transferred to other water craft. The facilities of this character in Hamburg harbor are well-known. In that port they are largely used by ocean-going craft, whereas their use in this country is principally by canal boats and vessels of similar size and is infrequent.

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Wherever large craft are carried considerable distances inland along narrow channels, either artificial or natural, it is often found advantageous to turn the vessel in a basin located near the inland end of the waterway. Many harbors are thus provided with turning basins. Examples are to be found at the inner end of the so-called canal designed for the Newark Harbor improvement. A turning basin is also provided in connection with the inner harbor at Los Angeles. Such a basin is often advantageous in spite of the fact that modern vessels are usually towed to and from their berths, and that they can be towed stern forward practically as well as bow foremost.

Real estate on upland being so much more valuable than land under water, in most harbors the usual course is followed of first determining the width of waterway in the clear between pierhead lines, and the distance between pierhead and bulkhead lines (throughout which latter area only pile structures are to be permitted, because of the necessity of maintaining the tidal prism). The area back of the bulkhead lines so determined is then solidly filled so as to make many acres of land. The miles of meadow land or salt marsh surrounding Jamaica Bay, Newark Bay, and other branches of New York Bay, all of the low lands along the water front of Seattle, and practically the whole harbor at Los Angeles, have been created by depositing fill secured either from the upland or by the dredging of channels. In general it may be said that width of waterway is not so important as its continuation as far as possible into the upland. Many narrow waterways, such as the Cuyahoga River at Cleveland, the Chicago River, and Gowanus and Newtown Creeks in New York, carry tonnages almost as great as that of the Suez Canal, simply in serving the industrial districts which they tap. Such waterways almost invariably should be maintained because of their industrial value. Sometimes the effort is made to cut off their in-

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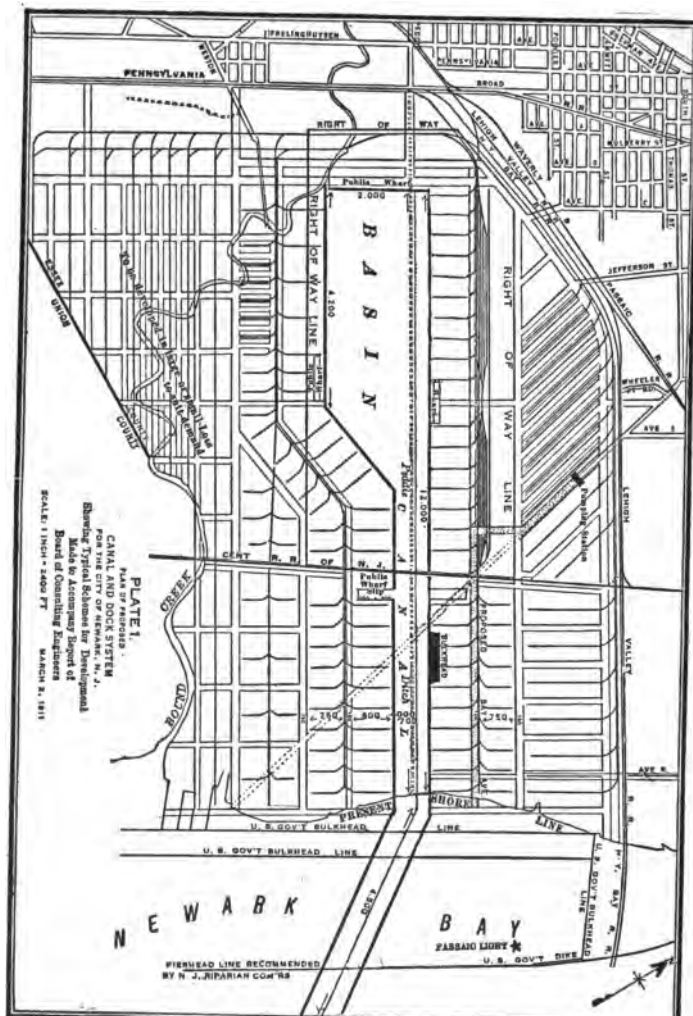

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efficiency by carrying numerous bridges across them, but under normal conditions the cost of carrying traffic around such waterways is much less in the aggregate than the losses involved in closing them to free navigation.

The Federal Government is charged with the establishment of pierhead and bulkhead lines, and the army engineers are exceedingly careful in their determinations of proper locations for such lines, having been trained to estimate many years in advance the commercial possibilities and in each case making an accurate study of the conditions involved in maintaining the tidal prism necessary to prevent sedimentation in approach channels and other losses involving extra costs for maintaining navigation. Wherever the government has not already made a study of the situation, it is wise to secure their action at the earliest possible date to prevent encroachments upon the waterway by unscrupulous commercial interests.

The Hinterland

The development found upon the upland dictates to an almost paramount extent the type of the adjacent water-front structure. *First,* a city in active life, with large manufacturing and shipping interests, demands correspondingly intricate terminals. *Second,* that part of a city which may be considered in a passive condition, i. e., of a residential type, usually desires the possession of the water front for the location of beautiful estates. This phase is, perhaps, not so much urban as suburban or rural, but must be considered in any discussion of water-front problems from a city-planning standpoint. *Third,* the artistic and recreational phases of city life demand the reservation of the water frontage for park and boulevard purposes; and modern thought seems to be tending towards this use rather

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than permitting the monopolized one of villa sites, by designing a boulevard between the villas and the water, as at Bar Harbor and Newport, and as has been proposed for part of the Cleveland lake front.

While the type of development is an important determining factor, the topography of the border strip on each side of the water's edge needs to be considered with the greatest care. The treatment to be accorded a low, originally marshy approach like that in front of Newark, N. J., is, of course, radically different from the development which must take place where the water front rises abruptly in high bluffs to the city proper, as, for example, in the central portion of Seattle, Wash.

The facility of communication between the hinterland and the water front is important. Unless a proper street system connects the business and industrial parts of a city with the wharves, the latter might just as well be located upon an island or in an adjoining city. An example of such oversight is to be found in some of the earlier plans (comprehensive plans, so-called) of a municipal harbor on one of the Great Lakes, in the design of which the utmost care had been exercised with reference to the whole harbor zone, but no thought had been given, even after the harbor designs were practically completed, to any sufficient means of access between the city proper and the harbor. Only two or three streets, for example, connected these two important parts of the community throughout a distance of several miles of water frontage. A glance at a street map of Manhattan Island shows that those who laid out New York City went to the other extreme. Over the major portion of the area of the borough a gridiron system exists, with blocks 200 feet wide and from 600 to 800 feet long. The short dimension of block is parallel with the water front so that a street presumably terminates at the water's edge every 260 feet. Such a system is theoretically ideal

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for reduction of congestion along the water-front, and for easy communication between it and the center of the city.

Obviously, the number of streets needed in any case depends largely upon the street traffic which must be carried. If a port is used primarily for the transshipment of goods between large and small vessels or between the water front and factory buildings located thereon, there is relatively less necessity of a highly amplified street system than if the major part of the commerce moves over the streets from the water front to the hinterland. The latter condition will exist in a community which is highly developed from a mercantile and manufacturing standpoint and to feed which the waterway is used to a large extent. Pittsburgh is a large manufacturing community, but the waterway on which she is situated does not contribute to any great extent at the present time toward supplying her a highway for the transportation of crude or manufactured articles. On the other hand, most of the cities on the Atlantic seaboard have had their street systems designed for easy communication between city proper and water front.

In such intensive development as is found on the west side of Manhattan Island, where piers are projected out from the water front as closely as possible, so as to provide the greatest amount of berthing space per front foot of the hinterland, larger street areas must be given up to vehicular traffic. The first street back from the water and parallel with it should be of ample width, not less than 100 feet. The latest water-front designers do not concur with the older engineers in believing that a marginal street along the bulkhead is an advantageous method of handling traffic. Such street preferably should be placed back from the water front possibly 200 feet or more, so as to provide ample space for interchange of merchandise between water carrier and vehicle, and to afford possibility of storage room for products not destined for immediate delivery.

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Facilities must also be provided for the railroads to reach the bulkheads where necessary. With a marginal street, the transfer is forced out onto the piers or else most of the merchandise must be handled across such marginal street, with consequent interference with its traffic.

Almost in direct proportion to the number of streets necessary for proper communication for freight transportation reasons, facilities should be supplied for the transportation of people by street railroads or their equivalent. If the water front is used as a passenger transportation terminal, the necessity is obvious for the carrying of large numbers of people to and fro between the city proper and the wharves. The requirement, however, is almost as great where large amounts of cargo are interchanged at the wharf, because of the great number of stevedores and dock laborers needed to effect its transfer. Such passenger facilities must be studied with special reference to the peak loads which must be carried. In the case of dock laborers, congested conditions are likely to exist morning and evening. In the case of passenger transportation terminals, the times of arrival and departure of vessels will be times of congestion. It is thus seen that ample passenger facilities should be provided.

In a somewhat similar manner the railroads should be connected with water-front structures in a more or less intimate way. On the shores of the oceans and the Great Lakes, where a considerable interchange normally takes place between water and rail carriers, the ideal scheme is one in which each railroad line reaches each element for the handling of merchandise at the water front. In some instances this has been accomplished by a combination road, or belt line; the "belt" idea being employed only because it is usually most convenient to secure the desirable ideal of every road reaching every water-front point through the construction of a line of tracks along the water front, over

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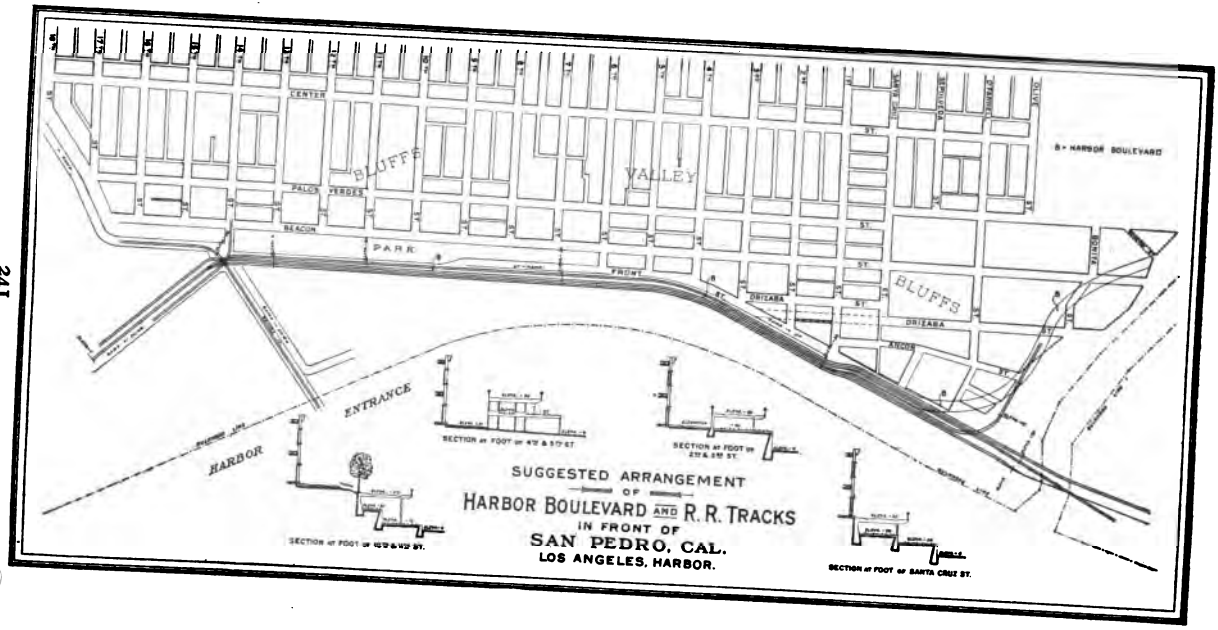

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which tracks all roads may move and connect with each pier and bulkhead by means of suitable spurs and sidings. Experience has shown that the interchange of commodities by land conveyance, between points on the water front, is almost invariably much more expensive than their transportation by water, even where a so-called "belt" railroad exists. Railroad facilities should, therefore, be designed primarily to secure the easiest access between the water-front and each of the trunk-line railroads reaching the community, without requiring each road to operate an independent system to each water-front structure. In rare cases is it possible or proper, deliberately to construct a belt railroad line paralleling the water frontage. Very few of the best-known harbors of the world possess a continuous belt railroad such as that described above. In New Orleans, a half-dozen or more railroads had so occupied water frontage with their tracks, and had so managed their business, as practically to exclude the general public from use of the shore front. So heavy were the cumulative switching charges over the several short sections of railroad belonging to the several companies, which it sometimes became necessary to traverse when a merchant desired to send a car over some special road from his plant located on another, that the community found it advantageous (in the effort to reduce such charges) to construct a railroad paralleling the river front and at the same time paralleling each of the short sections of railroad which occupied the shore. Had the railroads coöperated in the interchange of business and endeavored to benefit the community at large, the latter would not have been involved in the uneconomic scheme of expending money for a duplicate railroad system of the belt-line type. This road amounts simply to a means of coercion over the railroads in order to secure equitable shipping charges. It was necessary for no other reason. In any plan for a terminal, either large or small,

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it is necessary to study the specific conditions which are likely to exist and design only with them in view. If business agreements could have been reached in the case of New Orleans, as were secured in Toronto, or as may be considered as possible in any other normal condition in accordance with which each railroad uses the others' lines to a greater or less extent, then the scheme of a belt railroad could be ignored, and the system laid out in a much more economical and satisfactory way.

Just as with regard to all other parts of a city, so with water-front areas, the relation of railroad trackage and vehicular street space must be considered, only a minimum of area being allowed for joint use. The whole trend of modern thought is for the entire separation of railroad trackage and city thoroughfares through grade crossing elimination. This is not always possible near the water front, but the widest possible separation should be devised.

Entirely distinct from, and in addition to, the matter of street arrangement—that is, the direction in which principal streets run compared to the water front, and the distance apart of those which lie perpendicular to it—there exists the great question as to the shape of the plots of land adjacent to the water. Whether the land is to be used for park purposes, for large manufacturing enterprises or railroad terminals, or for small factories or loft buildings, makes a vast difference. A plot destined to be a park is usually determined as to its boundaries by the topography, studies concerning outline and arrangement being made primarily with reference to recreational and esthetic features.

A plot destined for a railroad terminal is of greater value to the railroad when it is long and narrow than when short and wide, because of the advantages and disadvantages in securing proper switching leads and track lengths. A railroad terminal thus preëmpts long stretches of water front

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when it is close to and runs parallel therewith, and, if for no other reason, seldom should be allowed to occupy for yard purposes space directly adjacent to the water, even when a considerable interchange of water and rail business is possible. The yard should be placed away from the water frontage with necessary leads reaching the bulkhead, and only enough trackage close to the water to provide for immediate switching facilities without reference to long-time storage, or consolidation, or transfer yards. Manufacturing enterprises which need water frontage ordinarily need not occupy any considerable length of bulkhead. The larger tramp vessels of the present day are seldom more than 400 feet long. A vessel can be amply accommodated when tied against a bulkhead on a frontage of that length. With a frontage as long as 400 feet, however, a slip could be cut into the shore or two piers projected from it so as to provide two berths with more than double the loading space secured in the same shore length that would be occupied by a vessel lying alongside a shore bulkhead.

Again, only the very largest manufacturing enterprises need a plot of a width greater than 400 feet, great depth back from the water front being found fully as advantageous as great shore frontage under almost every condition. In the case of loft buildings or small manufacturing enterprises grouped in combination structures, there may sometimes be such a large amount of tonnage derived from each building, with its numerous floors, that the Manhattan street arrangement may be found advantageous. Even in the case of such intensive use of real estate for manufacturing purposes, however, it is normally found satisfactory to space streets running to the water front about 450 or 500 feet apart, streets and railroad tracks often being made to occupy alternate locations spaced half that distance apart. The arrangement of most of the industrial buildings at the Bush Terminal, than which there is probably no greater

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concentration of manufacturing activity anywhere in the world on a similar plottage, is designed on this principle, although the streets and railroads are only about 100 feet apart.

The depth of plot back from the water front must often depend upon the topography. In flat country, however, where the planner can chose his own depth, 600 to 800 feet should be considered the maximum, unless it is found desirable to maintain a marginal strip close to the bulkhead for some special reason. Obviously the shape of the hinterland must of necessity also determine the street system to some degree.

The Marginal Strip

The structures which must occupy the marginal strip and determine its general character will obviously depend upon the use to which the immediate hinterland is put. When a park adjoins the water front, the marginal strip must contain pleasure boat landings, bathing beaches with the incidental bathhouses, rest rooms, and similar structures, with walks and drives closely adjacent to the water frontage (depending largely upon topography), and strips of planting of different varieties to frame the marine pictures and beautify the setting of the whole. In connection with the walks must be outlooks, rest pavilions with seats, shaded spaces, and all of the well-known devices for the relief of humanity developed in park architecture. In northern climates, especially on fresh water, provision must be made for winter sports, and club houses of a more or less complete character must be erected adjacent to the natural skating places or those artificially produced. Other sports, such as ice boating and curling, must not be omitted, and accommodations should be arranged for the summer water sports of high diving and boat racing.

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Where the topography is abrupt, opportunity is increased for exceedingly attractive boulevards. There is, perhaps, no more beautiful ride than that along Riverside Drive, which parallels the Hudson River for several miles within the Borough of Manhattan, New York City, running most of its way through Riverside Park. Advantage has been taken of the opportunity to develop the best in landscape architecture. Under such conditions resort is often made to high retaining walls and sidehill rock cuts to carry the road, while picturesque resting places are arranged where conditions afford points of vantage for outlooks up and down the miles of river, from which views may be obtained of its shipping and pleasure craft. The most varied selections are afforded for walks, planted spaces, sites for monuments, fountains, and similar architectural and esthetic structures of every character.

Where manufacturing sites abut the water front, the special features which mark the marginal strip are those primarily needed in the handling of the incoming crude products such as fuel, ore, and sometimes cotton and other specialties, and for the shipping of the outgoing manufactured articles of the thousand and one miscellaneous commodities handled.

While the esthetics of a huge ore dock or coal pocket cannot be considered as of any moment, there is still a considerable social interest in the magnitude and efficiency of such devices, and, wherever possible, attention should be paid to providing access for the public along carefully devised streets, preferably overhead or so otherwise disposed as to afford a bird's-eye view of the water front. Foreign cities have given this phase of the subject much more thought than have American cities in general, although the harbor boulevard proposed for certain sections of Los Angeles would compare most favorably with the thoroughfares along the Seine in Paris, or at some points

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in the cities upon the banks of the Rhine. Antwerp harbor is celebrated for the promenade which overlooks all of the harbor operations along a considerable length of the Scheldt, where transfer of merchandise between vessel and warehouse and railroad car takes place by means of great traveling cranes and similar devices.

The type of wharf construction must of necessity depend upon the use to which the marginal strip is to be put. If deep-draft vessels carrying heavy loads are to be accommodated, the design must be that of a massive wall or an apron reaching out from the shore, so that the vessel can lie in deep water and still be tied directly against the shore structure. Along many rivers subject to wide fluctuations of level, both in this country and in Europe, the banks are sloped and the slopes properly paved. This paving serves two purposes—it protects the banks from erosion and serves as a landing place for cargo. The paved slopes on the levees along the Mississippi River are well-known examples in this country, and some of the works along the Rhine are of this type.

For landing places for small craft, it is usual to supply floating stages. Such a one lately constructed on the Willamette River at Portland, Oregon (except for the pontoon) is of reinforced concrete and of excellent design. The same general scheme is used for ocean-going vessels in the celebrated landing stage at Liverpool, but has not reached any wide use elsewhere. The old-fashioned wharf boat used on the Mississippi, Missouri and Ohio rivers, consisting of an old barge connected with the shore by a bridge and so moored as to be capable of easy shifting with changes of water level by moving barge and bridge *in toto* up or down the slope, is a modification of the float landing.

Very many varieties of design for both the bulkhead wall and the apron above mentioned are found at different

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ports of the world, depending upon such matters as the rise and fall of the tide, the heights of low water and of flood, the draft of vessels which must be accommodated and the topography of the land close to the shore. The last consideration will determine the levels and locations of any thoroughfares adjacent to the bulkheads, the railroad tracks reaching it for the accommodation of manufacturing buildings or warehouses and transfer sheds, and all the other necessary elements.

While the width of waterway determines in some measure whether a pier or bulkhead type is to be used; while the range of water surface determines the height of the design (whether it is to be one- or two-story and whether or not basins are to be employed to obviate tidal difficulties); the kind of traffic interchange determines the next most important details of the structure. The various types of water carriers may be listed as follows:

(a) Ocean liners; varying in length from 1000 down to perhaps 300 feet, with drafts from 35 feet to 15 feet. Coastwise shipping may or may not be included in this category but usually is so considered. The craft on the Great Lakes are a unique variety because of their relatively shallow draft for a given length compared with ocean-going vessels. Otherwise they may be considered as of this type.

(b) River craft such as that found on the Mississippi and to some extent on the Columbia Rivers in this country, and the special types found upon the Rhine and Danube in Europe.

(c) Canal boats of the old-fashioned type made famous by the Erie Canal in this country, or the modernized varieties found almost exclusively in Europe at the present time, but likely to become more familiar in this country upon the completion of the New York Barge Canal and upon the canalization of some of the inland rivers.

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Methods of land conveyance consist of the following:

(a) Rail carriers of the transcontinental railroad type.

(b) The high-speed trolley railroad, which is coming more and more into prominence in different parts of the United States.

(c) The varieties which traverse the city streets without the use of rails, among which must be included the motor truck and the horse-drawn vehicle.

Types of wharf structures must be provided which will permit interchange between each one of the water carriers and each one of the land carriers in both directions, and also between each two varieties of water conveyance. These several interchanges may be listed as follows:

Ocean to rail.
" " truck.
River " rail.
" " truck.
Canal " rail.
" " truck.
Ocean " river.
" " canal.
River " "

Interchange between the several types of land conveyance usually will be found to take place at other points than the water front, because of the value of the latter for use by strictly water-borne craft, and its usefulness for park and other purposes when not demanded by water commerce.

Studies in connection with every modern port design are being made to a much greater extent than in former years, looking to securing greater facility of handling and consequent economy of interchange. The location of railroad tracks upon piers or bulkheads has received most detailed analysis, but even where found unnecessary,

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old habits still continue to dictate to a noticeable degree, and tracks are often placed where they are actually detrimental. Tracks are almost invariably found placed adjacent to the stringpiece on all pier and bulkhead structures built on the Pacific Coast, whereas this location is rare in Atlantic seaports. The actual amount of direct interchange possible and probable should be the determining factor. Obviously, this will vary more with the commodity than with any other feature, it being necessary to have some commodities landed and inspected by customs officers before they can be reloaded; and miscellaneous cargoes usually need to be distributed and re-collected. It is thus seen that bulk cargo only, and a relatively small quantity of very heavy pieces, can be handled advantageously through direct interchange, but that otherwise there is likely to be loss of motion with involved extra cost where the majority of the cargo must be transferred across an open space designed for railroad car use but not so occupied during any considerable part of the time.

Furthermore, it is manifest that the type of commodity handled, whether passengers or freight, will also determine to a great extent the design of the wharf structure. As has already been pointed out, general or miscellaneous cargo needs a different type of structure than that required for special cargo, such as ore, grain, coal, fruit, cotton, etc., when handled in large quantities. Passenger accommodations naturally must be much more elaborate than those for freight; ticket offices, waiting rooms, toilet facilities, baggage and express offices, restaurants, etc., not being essential to the handling of the latter.

The transatlantic piers on the west side of Manhattan Island, New York City, in the so-called Chelsea district, are well known for their adequacy as combined passenger and freight piers for vessels of the largest type. An interesting design which was developed in an effort to

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accommodate practically all of the several varieties of interchange listed above is to be found at Portland, Ore., where both ocean-going vessels and river craft are found, where a railroad spur touches the dock and motor trucks and horse-drawn vehicles are accommodated, and where so great a range of water level occurs yearly that a two-level structure is required.

The facilities on the landward side of the water front must include dry docks of various sizes, in accordance with the demands of shipping, with attendant machine shops, cranes, and outfitting establishments. Where the water front is designed to accommodate special types of cargo, such as ore, grain, etc., storage facilities must be specially designed. The unloading ore docks at Ashtabula and Buffalo, and the ore-loading docks at Marquette, are known the world over, while the grain elevators at Duluth and Montreal have been widely pictured. The new designs for the port of Seattle include special accommodations for fish, lumber, grain, and fruit, in addition to a development of ample proportions for miscellaneous cargo. New Orleans has lately started special cotton-shipping warehouses, with equipment of the most modern and economical type. A study of any port problem from a city-planning standpoint must consider such specialties in a comprehensive scheme.

Usually warehouses must be provided where miscellaneous cargo can be handled in any quantity, in addition to the bulkhead or pier sheds where merchandise is deposited temporarily for quick transfer to vessel or land conveyance from the opposite carrier. In some instances, where foundation conditions are suitable, warehouses may be combined with the shipping shed in multi-storied structures. Such is the case in Liverpool around the wet basins. Normally, however, the warehouses can be more economically placed on the upland, with less expensive sheds on piers or bulkheads, the former to be used for long storage and

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the latter for the purpose of transfer, sorting and quick delivery. Where conditions warrant, these wharf sheds can be built two stories in height, one story to be used for incoming and the other to be used for outgoing cargo, for example; or one for passengers and the other for freight. The well-known piers in the Chelsea district of the Borough of Manhattan, used by the transatlantic liners, and the newer structures in Boston and Montreal, are of the two-story type, while the designs for all but one of the highly efficient piers at the Bush Terminal in South Brooklyn are of one-story construction, storage warehouses six or more stories in height being placed on the land immediately in the rear of the bulkhead and a hundred feet back from it.

General Economics of the Problem

A relationship must exist between the land and water areas; the length of water frontage and the tonnage to be handled over it; the tonnage in proportion to the people served in the community and those occupying the tributary territory or hinterland. Again, the rate of growth as a port will follow nearly the same rate as that of the community at large, and the tonnage of the port can be compared in proper terms with the manufactures, the railroad tonnage, and other indications of a community's growth.

The land and water areas depend for their relationship upon the speed with which vessels can approach the wharf, how rapidly the vessels can be unloaded, with what celerity the cargo can be moved from the wharf sheds, and whether stored in warehouses adjacent to the water front or shipped to distant points, together with the percentages which are so stored and shipped. More water area is required where vessels must approach the dock slowly and must anchor for longer or shorter periods in almost every instance.

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TABLE I

PROPORTION BETWEEN THE WATER AND LAND (SURFACE)

Ports	A Surface of Water in the Docks, in Hectares	B Surface of Lands adjacent to the Docks, in Hectares	Proportion, A / B	C Surface of Water of the Docks and of free water (anteport or river), in Hectares	D Total Surface of Lands, in Hectares	Proportion, C / D
Antwerp	645	575	1.14	1145	775	1.48
Amsterdam	75	53	1.42	...	...	....
Barcelona	48	33	1.45	100	33	3.33
Bremen	20	45	0.44	...	...	....
Buenos Aires	662	70	0.95	1302	80	1.62
Dunkirk[1]	43	55	0.78	65	60	1.08
Hamburg	1644	1114	1.47	2793	1114	2.51
Havre	774	485	1.59	977	525	1.85
Genoa	92	56	1.64	182	56	3.25
Marseilles	1203	742	1.62	1508	742	2.03
Rotterdam	60	95	0.63	260	170	1.53
Rouen	482	594	0.81	...	....	....
Triest	50	50	1.00	...	....	....
Average	....	....	1.15	....	....	2.04
[1] Old Docks	12	5	2.40			
Freycinet Dock	31	50	0.62			
Total	43	55	0.78			

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The speed with which the cargo is removed from the vessel and loaded into it will determine the total length of wharfage required and, therefore, the proportionate dimensions of the water area necessary to accommodate vessels approaching and anchored while waiting for a chance to discharge and load. The width of wharf shed will depend largely upon the celerity with which the cargo is removed from that structure, provided always the wharfage along

TABLE 2

TONNAGE PER UNIT OF WATER AND LAND SURFACE

Ports	Marine Movement per Hectare of Sheltered Water, in Tons[1]	Commercial Movement per Hectare of Adjacent Land, in Tons
Hamburg	77,500	93,000[1]
Antwerp	104,000	144,000[1]
Liverpool	113,000	.....
Dunkirk (docks)	80,000	54,000
Havre (docks)	74,500	72,000
Barcelona	55,500	49,000
Marseilles	100,000	84,500
Genoa	97,000	77,000
Triest	126,000	.....
Buenos Aires	115,000	37,500

[1] The ground lying behind the quay walls built on the river shore has been taken into account in these figures.

the water is to be constantly used for discharge and loading of vessels, the wharf sheds not being used for strictly storage purposes to any appreciable extent. The amount of cargo transshipped by rail will determine the amount of trackage required, thus determining the amount of wharf space necessary for railroad tracks, sidings and yards. The amount of cargo stored near the water front will determine the size of warehouses within the limits dictated by the class of commodity handled, bulky produce requiring more space than metals or other heavy cargo.

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Experience alone can determine the relative spaces required for the several parts of a port mentioned. Such information is to be obtained only from an examination of the efficiently operated ports throughout the world. Concerning this item, Tables 1 and 2, taken principally from

TABLE 3

TONNAGE PER UNIT LENGTH OF WHARF PER ANNUM

Port or Docks	Unit Tonnage
Antwerp	374
Glasgow	176
Liverpool	148
Hamburg	135
Rotterdam	230
Havre	95
Dunkirk	124
Barcelona	132
Marseilles	194
Genoa	182
Gowanus Canal, Brooklyn	250
Newtown Creek, Brooklyn	170
N. Y. Trans-Atlantic Piers	210
N. Y. Coastwise Piers	220
Certain Brooklyn Piers	60
Capacity of same	150
Erie Basin, N. Y. Harbor	70
Portland, Oregon	158
San Francisco	128
Los Angeles	67
Total for 19 ports	2,899
Average of all except Antwerp	152

a report by J. Kraus, concerning the harbor of Valparaiso, give valuable information.

Where the water front is used with a relatively high degree of efficiency, so that vessels are almost constantly loading and unloading, one following another with but a few hours intermission, there is found to be an average rate at which cargo is handled. This average rate is not

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more than half the maximum one at which vessels are often discharged and loaded under stress of circumstances, such average taking account of delays, breakdowns, slack times, etc., through the whole year, and some portions of the port which are less efficiently used than others, because of kind of commodity or necessary method of handling. For example, miscellaneous freight cannot be handled as rapidly per ton as can grain, cement, or other commodities which can make use of special machinery, when such special commodity is to be handled in sufficient quantity to make such apparatus economical. Table 3, taken from the Report of the Jamaica Bay Improvement Commission for 1909, and somewhat amplified, gives information of port conditions throughout the world, with reference to the commodity tonnage handled per foot length of wharf per annum.

The problem as to the amount of water frontage which may be found advantageous in any case may be approached from several directions. Ports on the seaboard may be measured in terms of imports and exports with an allowance for other shipping (river, canal and inner harbor), plus a proper amount for industrial water-front use. Or the whole may be determined on the basis of the relationship of the manufacturers to the water transportation required to handle the imported and exported products. Again, the total tonnage, particularly in the case of ocean-going freight, has been found to bear some rough relationship to the number of inhabitants of a port. Data with regard to the length of total wharfage to per cent. of population in several cities of the world, is given in Table 4, while Table 5 shows the distribution between ocean-going, coastwise, river and inter-harbor craft and railroad and other usage on the west side of Manhattan Island. This percentage of relationship is not available for use under ordinary circumstances because of the fact that it includes no industrial district and, further, that the railroad use is larger than should be found

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advantageous in a broad way for the country, because in this case all products destined for Manhattan Island and derived from the majority of the trunk lines must be lightered across the Hudson River. It is estimated that

TABLE 4

LENGTH OF WHARF PER THOUSAND POPULATION

City	Length of Wharf	Population	Length of Wharf per 1,000 Population
London	223,000	7,429,740	30
Liverpool Birkenhead	187,269	704,134	268
Glasgow	53,700	735,906	74
Bristol	22,329	328,945	68
Hamburg	83,460	802,793	104
Havre	51,140	130,196	386
Dunkirk	28,643	38,925	73
Bilboa	111,585	74,093	136
Antwerp	74,696	300,000	249
Bremen Bremerhaven	51,459	260,000	197
Marseilles	70,922	517,498	140
Amsterdam	60,113	557,614	108
Lisbon	24,543	356,000	69
San Francisco	43,000	416,912	103
Portland, Ore	25,500	207,000	123
Los Angeles	24,000	400,000	60
Total for 16 ports	.....	.....	2,188
Average	.....	.....	136

fully 50 per cent. of the total water frontage of New York Harbor is used for industrial purposes.

So many varieties of structure have been described that it is almost impossible to give any general information as to probable costs without accurate knowledge of the special design in each case. One dollar and a half a square foot

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will cover the cost of most single-level pier and wharf structures. To this should be added a sufficient figure to cover the dredging between piers and the cost of pier sheds. The latter may be roughly estimated as $1.50 per square foot per floor. After all grading is done, a single-track railroad can be installed for about $2.50 per running foot. Warehouses for purely storage purposes can be built for

TABLE 5

PROPORTION OF WATER-FRONT USED BY VARIETIES OF SHIPPING IN NEW YORK

	From North Side of Pier New 1 to 125 Feet South of Pier New 48: 11,780 Feet = 2.23 Miles	From North Side of Pier New 1 to North Side of West 30th Street: 20,658 Feet = 3.91 Miles
Transatlantic steamships	1.4 per cent.	17.5 per cent.
Coastwise steamships	15.6	24.3
Railroads	47.9	30.8
Hudson River boats	5.3	3.0
Sound steamers	10.0	5.7
Ferries	9.5	7.8
Open wharfage	4.3	3.9
Miscellaneous: coal, ice, dumps, oysters	5.8	6.9
Recreation piers	0.2	0.1

somewhat less than $0.10 per cubic foot. Obviously, the total cost per running foot of bulkhead or pier stringpiece will depend upon many elements, but under normal conditions a figure of $500 per running foot may be allowed to cover costs of all structures back for a width of fifty feet from the stringpiece.

In America the tradition has been that the economic aspect is of the utmost importance. It so happens that in almost every port the shipping facilities are self-supporting; in fact, they have usually been developed because they will

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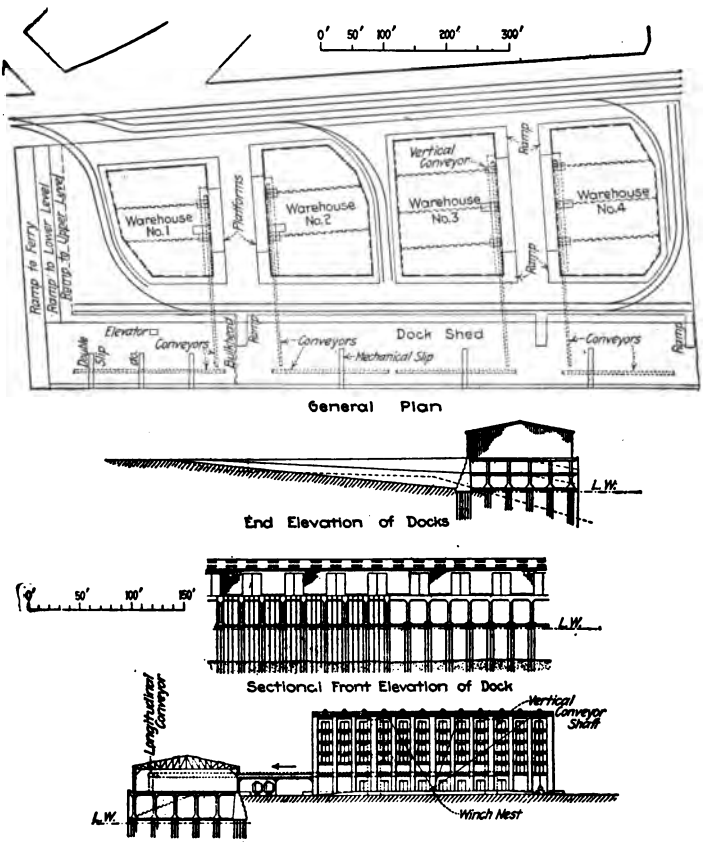
create a financial return. In consequence, water-front structures are often crude affairs, designed primarily to produce



Cross-section through shed and marginal street

PLAN AND ELEVATIONS OF TYPICAL PROPOSED DOCK STRUCTURES, PORTLAND, OREGON

the greatest financial return with the least primary expenditure. This financial aspect has been to some extent sub-

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merged in European city planning so that, while structures may be erected for utilitarian purposes primarily, the esthetic side is given much more attention than in this country. It is believed that this attention will often give a measure of return upon money spent in artistic treatment through greater interest created in the citizenship and, on the part of strangers, with regard to the wharf structures themselves, and, by reflection as to buildings in general, in the community at large. It should be said, therefore, that in city planning of water-front structures (as in probably every other phase), utility should stand first but the esthetic side should by no means be forgotten.

In considering the utilitarian aspect, the detailed economics of the problem invariably deserve study. It is very easy to sketch a system of piers, wharves, bulkheads, and railroad tracks along the shore line of any community, but such mere sketching is a waste of time unless the proposed structures bear some distinct and intimate relation with the problems with which the city is, or is likely to be, confronted, and the structures have been shown by experience to be those best fitted to effect a satisfactory result through efficient operation. It is wasted time to provide grain elevators where no grain will move, or to handle lumber through a miscellaneous cargo pier shed (except in the smallest quantities). Just as the type of merchandise must be studied, so must the specific location. A double-deck structure becomes particularly effective where the second level may be reached from high-level uplands by means of a short viaduct.

The most satisfactory approach to any port problem is to determine the topography of the site and the commodities to be handled through studies of geography (using that term in the sense both of topography and climatology), commerce, population, and all the phases of modern life. Then ascertain how as nearly similar problems as it is possible to

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find have been treated elsewhere, including each of the items above considered.

The setting aside by municipalities of large areas on the water front for purely industrial development is one which has been neglected in this country almost completely. In Europe, however, every progressive city on the Rhine, for example, has acquired property which it is holding for development as an industrial harbor district. Some of them already have immense chemical and iron industries located upon municipal land, or land which was originally acquired by the city and sold to the industrial concern at an attractive figure. The little city of Emden with a population of less than 20,000, has set aside a water-front site consisting of over 1,000 acres to be devoted to industrial works "which will develop in course of time."

While the city planner may have little to say as to the policy with regard to the factor of municipal ownership, it should be constantly borne in mind that the whole tendency of modern times, with regard to water-front ownership, seems to be towards complete municipal control instead of private ownership. Owing to the great success which has attended municipal ownership of docks in Europe, and in those cities in America which have practiced it for any length of time, most experts on the subject consider that municipal ownership and a limited leasehold to operating individuals or companies is the wisest method of operation of water frontage at the present time. The variety of ownership, of course, will modify to a certain extent the design of structures. Where private ownership exists there is a natural tendency to exclude the public. Under municipal ownership, however, the public is given greater freedom of access, which must be reflected in the designs finally worked out, in any case.

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CHAPTER XII

RAILROADS AND INDUSTRIAL DISTRICTS

Relation of Railroad Units to the City Plan

The Main Artery.—The right of way, concessions, and features of development of the steam railroads or the main transportation routes are more often sources of annoyance to the planning engineer, than foundations on which a constructive plan can be erected with facility. Pioneers as the railroads were in the development of most communities, it is small wonder that the line of least immediate resistance was followed to such an extent that a typical and homogeneous plan was seldom possible with the full acceptance of the steam-railroad features as they exist. From time to time, however, betterments are instituted by the railroad companies in the way of new passenger stations and approaches, track depression or elevation with incident grade crossing eliminations, increased main-track facilities with possible electrification, and new freight stations with bulk freight team tracks and approaches.

These features of reconstruction or improvement are subject to the approval of the municipality, and it is then that an intelligent analysis by a city-planning board, with its advisory experts, will safeguard the city plan in the interest of posterity. This is no reflection on the capacity of the railroad staff of engineers, but it is obvious that fundamentally their view of the problem is limited to the confines of the railroad right of way and immediately con-

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tiguous property, and that their interest is essentially narrowed to that of the corporation they are paid to serve. On the other hand, the city-planning board not only combats the narrow view of the railroad engineers, but, what is quite as important, their study of the problem and the resulting plan will often establish essential relations between features of the city plan and strictly railroad units which may be geographically remote.

Branches and Leads.—The entrance of subsidiary lines or leads to industries and special service stations and to junctions with the main line, by still further cutting up the topography, presents additional features of rigidity, the acceptance of which limits the possibility in directions which are apparent. While these railroad features must, as a rule, be accepted as they exist, not infrequently a radical change is possible entirely in line with ultimate economy, provided the plan is fully matured, and its practicability to the end of general betterment and economy well established. Too often, unfortunately, "curtailment in initial expenditure" is confounded with "economy." In many instances a seemingly disproportionate initial expense is amply justified by a proper economic analysis.

Freight Delivery Stations.—The principles underlying parcel and bulk-freight shipment and delivery are open to continual discussion. The small community is served by its single freight house and group of team tracks, and team haul to and from this single railroad unit is necessary for the surrounding territory. From this most simple type conditions amplify to those of great complexity in the large city with several trunk line entrances, and the freight-delivery features within the community located at intervals along the several railroad thoroughfares. While in the larger communities served by freight-delivery and receiving stations the units may be geographically well distributed, there is usually a characteristic rigidity attached to the sys-

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tem, in that goods *via* any individual trunk line may be shipped or received at freight stations of that line only. Otherwise a switching charge is exacted and delays are probable. There is, furthermore, often an added stipulation by the carrier company that goods be further segregated by classification, so that a merchant or manufacturer, wherever located within the community, is confronted with the necessity of hauling the bulk of his product to a single freight station.

This condition of affairs is natural and the logical result of competitive railroad development. It remains, however, for the municipality, through its city-planning board, to incorporate within its plans for ultimate development the means whereby the maximum flexibility of operation in terminal transportation shall be available to the producer; that is, *whatever the origin or destination, a merchant or manufacturer should receive and ship at the freight station which entails the shortest team haul.* To aim at this achievement is the duty of any board or commission entrusted with the preparation of a city plan. A belt-line road either operative or geographical will often solve the problem. Under this condition goods to or from any freight station may be routed direct *via* any trunk line, and obviously the producer enjoys the shortest team haul from plant to carrier. The agitation today in many large centers is primarily toward the achievement of this most flexible condition, and to this end many standing and special boards and committees are now working.

Industrial Districts.—A concrete definition of an industrial center or development would outline a productive community, self-contained from the receipt of the raw material to the shipment of the finished product, with common interest among the several producers as to the elements of general facilities covered by rentals, power, taxes, insurance, and transportation facilities. There are many industrial

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BUSH TERMINAL PLANT. VIEW FROM BALLOON

BUSH TERMINAL RAILROAD YARD. ACCOMMODATION FOR 2,000 STANDARD CARS

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localities but few developments. One of the best known developments which has expanded along predetermined lines is that of the Bush Terminal Company in South Brooklyn, New York. This center is located with ample pier facilities on New York Harbor, and with rail entrance direct or indirect to all trunk lines entering the New York City terminal district. To a lesser degree industrial centers or manufacture grouping with operating administration, power requirements, and transportation features pooled are common to all larger communities.

As a rule, these industrial centers or districts must be accepted by the city planner as they exist. Manufacturing enterprise is certainly to be encouraged for the actual advancement of any community, and in this instance, if in no other, the esthetic consideration of the plan should be subservient to the practical requirements of manufacturing economy.

Constructive Planning Based on Existing Conditions

Extent to Which Acceptance of Present Development is Advisable.—The transportation engineer of the city-planning board is always confronted with two extreme alternatives. He may plan for the perfect conception on paper, regardless of existing conditions, or he may accept present conditions and build thereon. A sound analysis of the entire problem, with due regard to the original and acquired rights of all parties at interest, will inevitably lead to a course of compromise. It is sometimes advisable to follow the line of least resistance, at the sacrifice of plan homogeneity, merely for the sake of erring on the side of immediate practicability. Many good suggestions and features of a city plan fail of acceptance because coupled with issues which, though ultimately desirable, are not essential to the immediate and obvious betterment.

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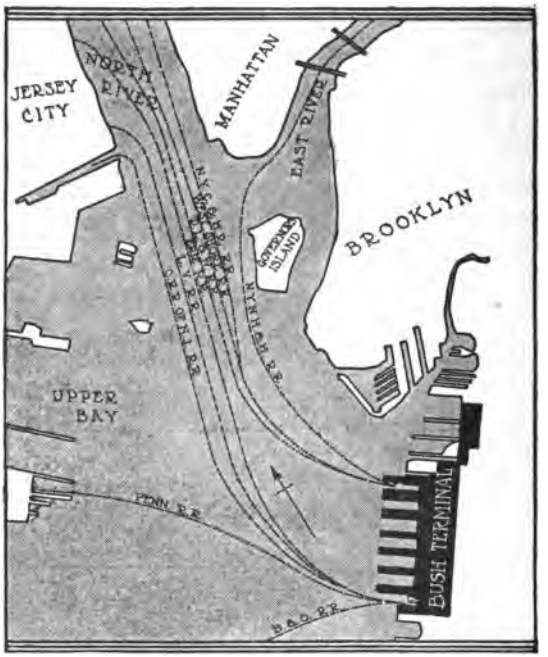
Considerations Underlying Studies for the Future.—It should be an accepted fact that plans are to portray ultimate development. The recommended layout should be such as to insure the maximum ultimate betterment to the community at large. It is, therefore, incumbent upon the engineer to specify in considerable detail the progressive



steps necessary to the fulfillment of the ultimate plan. In this regard the weakness of many plans is apparent. The ultimate layout may be complete, but failure to suggest the successive steps for accomplishment often leaves the plan to be digested as a whole, and its practicability is thereby doubly hard to establish.

However complete the paper plan, without the semblance

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of practicability and recommended method of approach and attack, its nonacceptance by the transportation interests is virtually assured. Studies for ultimate development are obviously subject to an interpretation of the term "ultimate." Without any academic analysis, however, the studies for a municipal plan should be worked out to a practicable ideal for gradual realization, with the successive steps for achievement well defined.

Danger in Destructive Planning.—The plan or incidental recommendation which calls for the eradication of existing features of the community for the essential purpose of arriving at esthetic results is in general to be condemned. The commercial growth of any community is positive and along lines of definite purpose. To recommend any change in the present state of equilibrium invites opposition at the outset. One of the real elements of success in any plan is that quality which appeals to the actual producers of the community. Schooled as they have been in progress and growth along lines of true productive economy, they at once question any plan or recommendation which builds on the wreck of existing city features.

Conservatism and Practicability.—The city plan which appeals for its artistic symmetry, the type often exhibited at planning congresses, is rarely practicable. As a rule, plans of this type are fundamentally destructive. The conservative element is almost wholly lacking, and the very bigness of the conception is appalling. Had such a plan been prepared and adopted in time, usually decades or a century in the past, the result would have approached the ideal state. The seat of our Federal Government is a notable, if not the only example of an American city developing along the lines of a well worked out plan adopted in ample time. Washington, however, is preëminently distinct in type and atmosphere, and commercialism has played little part in its growth.

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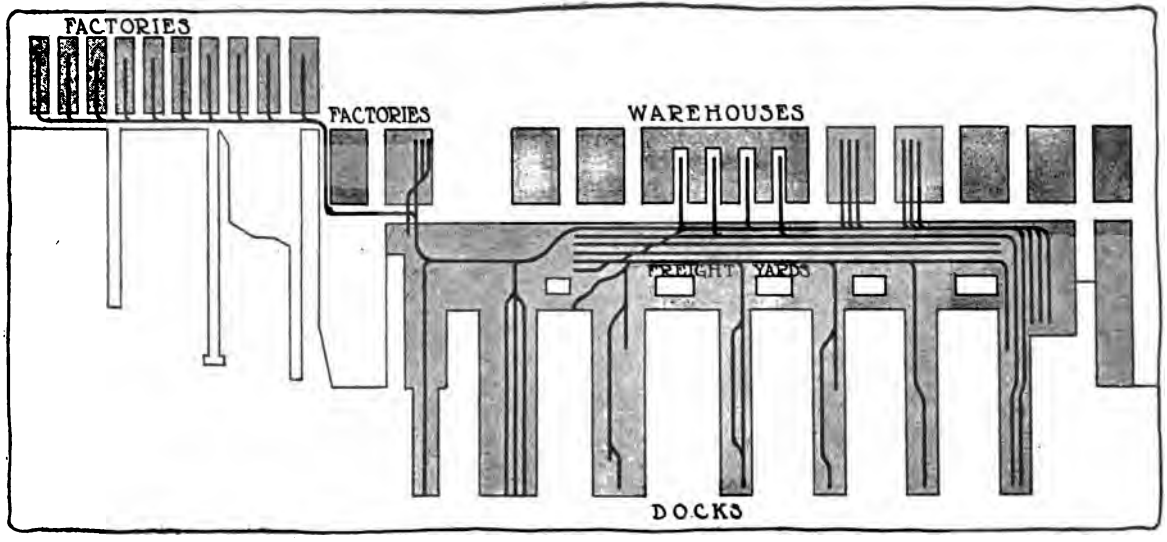

LAYOUT OF THE BUILDINGS, FREIGHT YARDS AND DOCKS OF THE BUSH TERMINAL
Designed to render quick shipping service to the occupants

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On rare occasions a wide-spread conflagration will raze to the ground a comparatively large area of a great city, thus removing many rigid barriers to the development of a city plan of artistic scope. At junctures of this sort the city plan along radically new lines is agitated. Drawings are prepared and discussed. An opportunity really exists. The conservative element, however, usually predominates, sufficient imagination is lacking in the minds of those whose judgment is followed, and the great American factor—commercialism—advocates reconstruction along former lines, and the opportunity is lost. Possibly the most notable example in recent years is the city of San Francisco. This leads to the natural conclusion that conservative practicability is the one element most likely to carry any plan to acceptance.

Railroad Terminals and Approaches

There is hardly an American city of two hundred thousand population or over that has not been the subject of more or less extended study with regard to the ultimate unification of the operation, if not the actual ownership, of its terminal steam-railroad properties. In rare instances only have these studies proved the basis of actual consolidation, and in these instances the interests at issue were not widely divergent. The mere fact that unification schemes are afoot, however, shows unmistakably that, in the minds of those with motives entirely disinterested, the operating flexibility which is possible only in a unified terminal property is essential to the attainment of terminal transportation facilities of the highest type.

One has only to study the growth and development of the several independent trunk-line properties in any single community to observe that the inevitable and natural trend is towards joint control and operation. The joining of two

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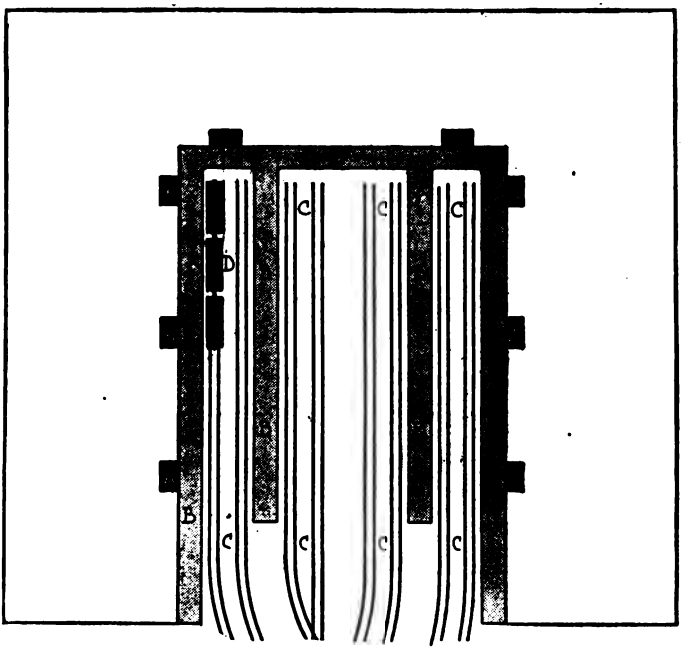
or more railroad properties is usually coupled with the actual pooling of terminal interests of the hitherto competing lines, together with the consolidation of operating and traffic units, from which follow increased operating economy



PLAN VIEW OF THE MAMMOTH U-SHAPED FACTORY BUILDINGS, BUSH TERMINAL

Showing how the elevators A communicate with the loading platforms B. The freight trains D can enter the enclosure and reach all parts of the building by means of the tracks C. There are frequent switchings and sidings to facilitate rapid handling of the cars.

and added flexibility of terminal operation. The features of the consolidation, however, are naturally confined to those properties under joint ownership or control. Where formerly there may have been twelve or fifteen competing trunk

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lines with their respective and varied terminal facilities, the natural law of effective consolidation to achieve ultimate operating economy has reduced this total to three or four independent trunk-line interests.

Any further consolidation on the initiative of the railroads themselves is unlikely. The state of equilibrium among the few remaining large railroad interests is well established, and the actual features of reconstruction resulting from the successive consolidations are more or less modern and up-to-date. The investment represented in the terminal properties is enormous, and this very size offers to the proposition of further unification an inertia difficult in itself to overcome. In recent years federal and state legislation, actual or implied, has not been such as to invite further consolidation among the railroad interests.

In spite of this fact, however, it requires little foresight to predict ultimate complete unification of terminal properties into a terminal district transportation system which shall offer the maximum of operating flexibility to the public. Whether the further successive steps for complete unification are possible without state or federal ownership is doubtful. At all events, it is manifest that public interest through city-planning or other boards or commissions must initiate further action or deliberation toward the accomplishment of the desired ultimate result. Those adherents to the slogan "Competition is the life of trade!" would seem to be a drawback to true economic progress when they exert their influence as regards the trade of carrying and distributing goods and passengers within any metropolitan district. More than any other single fact that has stood in the way of still further consolidation within terminal districts is that inherent distrust of corporations by the average citizen. It is small wonder that this distrust or fear of the "nigger in the woodpile" has reflected to and through our lawmakers, and that thereby

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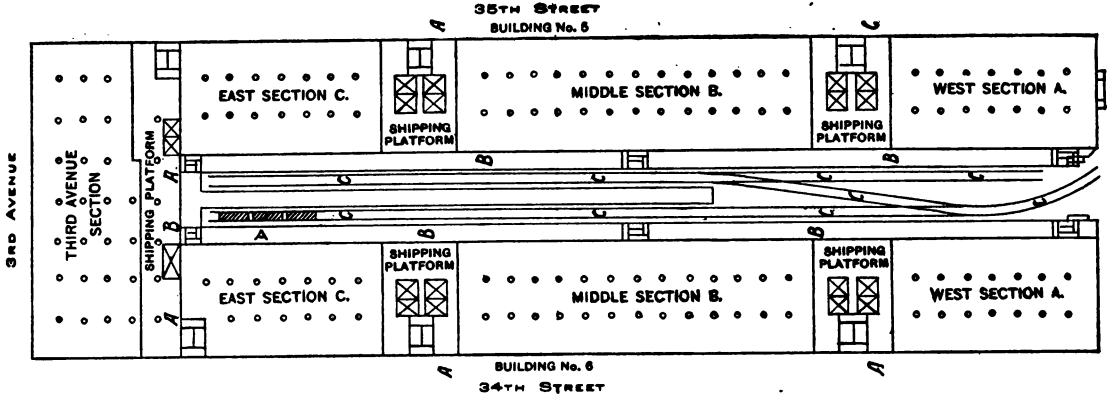

BUILDINGS NOS. 5 AND 6, BUSH TERMINAL BUILDINGS CO., FIRST FLOOR PLAN
"A" elevators communicate with loading platforms "B." "D" freight trains can enter enclosure and reach all parts of building by means of tracks "C."

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many really constructive plans for terminal railway consolidation and betterment have been blocked.

Industrial Districts

Among other important requirements for a factory site which shall offer characteristics for minimum production costs, is that of the transportation of the raw material and of the finished product. With a narrow or limited market, as in the case of distinct specialties, this factor may be less important, but as a rule, the producer should be offered facilities which make possible the rail routing from his shipping platform to any destination, without delays or a multitude of switching or interchange charges to be borne by him. If it possesses these advantages, and if in addition the industrial site is located on tidewater, where direct shipment is possible by boat as well as by rail, it may then be said that the transportation advantages leave little to be desired.

The characteristic of transportation flexibility, or the possibility of routing direct *via* any trunk line, with assured dispatch of movement, is well appreciated by all who have given the question any study. In connection with belt-line, interchange, or connecting railroads which circle the community to a greater or lesser extent, cutting all entering trunk-line roads, the location of the proposed industrial district is not difficult. Location along a belt-line road usually offers the further advantage of great latitude in choice as to the topography where a suitable tract is available at cheap land values.

The unencumbered tract offers the greatest scope for the design and layout of the proposed district. Although the initial stage of the development may be modest, the plan should be worked out and sufficient land purchased or con-

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trolled to cover the ultimate development probable. The layout of the factory buildings with power house, railroad tracks and storage yard, team thoroughfares, etc., is merely a part of the problem. The town features necessary to a happy and contented life for the operatives is an allied problem, quite as important.

Throughout the country, in various communities, there have been prepared, from time to time, by industrial or other commissions, plans for industrial districts. In some instances these plans have matured into working enterprises which have materially advanced the commercial standing of the community. In other instances, however, which probably predominate, there is no concrete result. In these latter instances the need is not apparent to the producer, and the inertia to be overcome in reëstablishing an active manufacturing plant in a new location and under different and, in a measure, unknown conditions is naturally great. The average manufacturer—not the great manufacturing corporation—is the one to be attracted by the advantages of an industrial district. The great corporation usually enjoys, on account of the magnitude of the plant, the very advantages which it is the purpose of the industrial district to offer to the average producer.

The Imperative Need of Growing Plans

The general trend of development in the past, for the city units themselves as well as for the features of the trunk-line terminal systems, and those of manufacturing enterprises, has followed the obvious and most simple line of extension, irrespective of any possible correlation between the interests enumerated, or with other features of the city plan. In the ordinary course of events, and in due course of time, one or another of the important features of the

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community has been blocked for further extension, not on account of the lack of natural foresight, but because its relation to other units of the plan was not predetermined.

A city plan advanced by public-spirited interest, with all features of the existing plan given due weight in the ratio of their relative importance, should be worked out for every community. Such a plan cannot be matured on order but should be under way and tentatively approved. The plan will serve as the basis for the analysis of any new enterprise suggested for the attention of the planning board. From time to time the plan will be modified and improved as added facts become available. Any plan worthy of due consideration must be subject to modification, and a plan accepted on this basis will in time become a true scale for the measurement of new propositions incident to the ultimate betterment and welfare of the inhabitants of the community.

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CHAPTER XIII

MAIN THOROUGHFARES AND STREET RAILWAYS

Influence and Importance of Transportation

One of the largest problems with which the modern city has to deal, and one which is proving most complicated and costly wherever efforts are being made to find a solution for it, is that of transportation in its various forms; for just as transportation has been the chief agency in promoting progress and creating wealth throughout the industrial world, so has it been the chief agency in the growth of cities, and so will it be the chief agency in determining whether the city of the future shall mark the zenith of man's triumph in constructive art and science or prove his inability to administer successfully the functions necessary to the perfect development of the huge organisms his own masterful energy has created.

The marvelous commercial and industrial progress of the past century has been made possible only by the creation and aggressive development of great transportation systems reaching every corner of the globe; men still living have witnessed or played an active part in the achievement of the greatest triumphs of these enterprises; they have seen the stagecoach and the wagon train give way to vast railroad systems and have seen the sailing vessel superseded by great steamship lines. We have only to compare the little steamboat in which Fulton sailed the Hudson with the great modern steamship, or Stephenson's first locomotive

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with those which now pull our limited expresses and fast freights, to appreciate the progress of the past hundred years. If, then, we reduce transportation to its simplest and most comprehensive term, the "act of conveying," and consider that it embraces every act and agency by which any object or substance is moved from place to place, and that all the mediums of conveyance have undergone the same rapid process of evolution as the railroad and the steamship, we obtain a grasp of the meaning of transportation and of its influence and importance in the economy of city building as well as of world building.

If we look for the force behind the progress and development of transportation, we almost invariably find it in private energy and private capital; the public has been prone to scoff, and sometimes to sneer, but seldom to aid or encourage the men who conducted the first experiments for the application of steam and electricity to practical uses; yet without these two forms of potential energy, industry and trade would be little more than local activities circumscribed and limited by eighteenth-century conditions.

While private energy and private capital were being put into the aggressive promotion of inventions and enterprises which were giving an ever-increasing impetus to constructive progress, the conservatism and perversity of public sentiment tended to discourage, if it did not actually and violently oppose, such innovations as steam or electrically driven machinery, the introduction of gas as an illuminant, the installation of street railways and the later substitution of electric power for horses in their operation, and the use of other appliances of constructive progress. While private enterprise spread a network of iron rails across the land, created trade routes across the seas, and contributed to the growth of great cities about their terminals and harbors and where important routes met or crossed, public enterprise, upon the spirit of which the physical form and char-

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acter of the cities depended, felt no inspiration and took no heed of the future, but permitted the cities to grow in whatever haphazard or aimless manner the immediate needs of the moment seemed to dictate. The same spirit of conservatism, together with the apparent impossibility of establishing continuing policies or obtaining sympathetic coöperation, still continues to obstruct the vision, fetter the energy, and tighten the purse strings of the public whenever a project of any magnitude outside the ordinary routine, no matter what its merits may be, is put forward as a public enterprise.

It is not at all surprising that the needs of modern transportation were not provided for in the early planning of the cities that have grown, or are ambitiously growing, to metropolitan proportions, for if those needs could have been accurately foretold to the town planners of only half a century ago the daring prophet would have been considered a dreamer and a visionary; but it is surprising, as well as something in the nature of a reflection upon the genius, courage, and aggressiveness of that American enterprise and energy of which we are prone to boast, that more active and systematic measures have not been taken in recent years to provide convenient and adequate channels for the flow of those vast activities which have built up great cities.

While every form of transportation is called to the service of the city, those forms which represent the daily flow of traffic through the public highways, and particularly the street railways or other mediums of public travel, come most closely in touch with the masses of the people, and the extent to which they serve and satisfy the public need is usually a fair index of the progress and enterprise of the community.

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The Street Railway and Its Service to the Public

Most cities quarrel more or less constantly and more or less violently with their street-railway service, and the traveling public almost invariably places all the blame for defective and inadequate service upon the operating company. The riders seldom look beyond their own personal and immediate convenience and the vision of the operating company seems to be too often limited to the easiest and quickest way of producing profits; neither of the parties to the quarrel seems to realize, or cares to admit, the extent to which each is dependent upon the other in their everyday relations, and that coöperation could be made to accomplish much common good where contention must meet with indifferent success, if not with total failure, as a means of harmonizing their differences.

No more convincing evidence can be had of the vital importance of street-railway service in the economy of urban growth than the insistent demand for "rapid transit" heard in every community, and yet it is probable that no enterprise which comes anywhere near so closely in touch with the masses of the people has received so little attention from their official representatives—at least until quite recent years—as the street-railway system. This is due in a large measure to the fact that, while the street railway has been a great benefit and convenience to the public, it has been financed and managed as a private enterprise, and its service to the public has been made to too great an extent subordinate to its ability to pay dividends.

The street railway, like its big brother the steam railroad, has possessed certain get-rich-quick features in its methods of both finance and operation, but these features are being gradually eliminated as the public comes to a clearer understanding of the fact that railroads are no longer luxuries or

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mere conveniences, but have become necessities and must be controlled and operated in the interest of the public service rather than for private gain. The operating companies also realize that a new deal is in progress and that better service must be given. Unwilling to abandon without a struggle the methods they have heretofore employed, they protest against making needed extensions to their systems, and in some cities are forcing the building of extensions and new lines at public expense, a policy which must result in public ownership and management and the driving of private capital out of the street-railway business unless it becomes willing to accept the reasonable profits which seem to satisfy the legitimate investors and holders of corporation securities.

But whether the street-railway business drifts into public ownership and operation, or whether private capital takes a saner view of what constitutes fair earnings and continues in control, thoroughly efficient and satisfactory service can only be given to all parts of a community by a well-distributed and a well-coördinated system which shall provide the most direct and speedy routes not only between existing important business and residential centers, but to and from points and through sections which need the aid and encouragement of good transportation facilities for their development into equally important centers. Such a system can be created only where the system of main thoroughfares, forming the routes which must be used by general traffic, is established with the primary view of providing adequate facilities for transportation.

Paradoxical as it may seem, the concentration and congestion which have characterized the growth of our big cities during the past thirty years have been both a cause and an effect of the centralization of lines of transportation. This concentration and congestion benefit a comparatively limited number of people who own and control

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the property and business within narrow zones, and work to the disadvantage of all other people and all other parts of the community; it makes the whole community contribute to a favored few in specially favored localities. Yet wherever, in American cities, we find rapid-transit lines in service, or great projects for the construction of such lines, we find them designed to feed the one great center; we even find that where private capital shrinks from assuming the cost and the risk of further catering to the special interests of this center, the public is called upon to pay the bills, and it seems not only willing but eager to comply.

The lower end of Manhattan Island and the Loop district of Chicago represent the maximum intensity of concentration yet produced by the intensive centralization of traffic, and both illustrate the dominance of the interests of the few over the interests of the millions. In the one case 5,000,000 and in the other 2,500,000 people are driven to contribute, directly or indirectly, to a single abnormally developed center, because neither has an adequate system of main thoroughfares; and each has a street-railway system routed for the benefit of the interests controlling the central area. In both, however, dissatisfaction with the existing conditions has been increasing rapidly in recent years, and official and citizen organizations are coöperating in efforts to obtain a new deal, in which there are an apparent desire and determination to get out of the ruts of habit and tradition and carry through vast civic undertakings in the interest and for the benefit of all the people.

In almost every city where systematic studies and specific recommendations for the improvement of transportation facilities have been made, the first discovery has been that the street-railway system is poorly planned and will not permit of such a routing of the railway lines as is necessary for thoroughly good service. These conditions are

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found in their most aggravated forms in the central areas toward which all lines converge. The only really efficient remedy, and the one invariably suggested, is the widening or opening of streets, but, as this involves heavy expense and the destruction of much property, it is seldom applied, and various makeshifts are resorted to, which in many cases not only lead to worse conditions but make it more difficult and costly to provide any practical or permanent relief. When the city reaches metropolitan proportions and the concentration and congestion become intolerable, the subway is resorted to, and vast sums are spent for the most costly, inconvenient, unhygienic, and limited kind of street-railway service, which, at best, only takes care of the natural increase of street-railway traffic and increases rather than decreases the evils of concentration and congestion and the difficulties of other kinds of traffic.

The popular conception of rapid transit as seen by the public at present seems to embrace subways only, notwithstanding the fact that they represent the highest initial cost and some transportation experts have said that no city can afford to build them. The rapid and continued growth of cities undoubtedly requires the adoption of street-railway systems of greater speed of operation and passenger-carrying capacity, and the construction and operation of such systems upon the street surface are not practical. But it must not be assumed that the popular demand for subways marks the limits of the usefulness or the development of the surface line, for if the institution known as the American home is to be perpetuated, there must be a more uniform distribution of street-railway service than can be accomplished by rapid-transit subway and elevated lines alone. It is probable that the cost of the latter will limit their profitable use to trunk-line service; and this would result in a concentration of population and business along them which would tend to perpetuate and in-

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tensify the very evils which good transportation facilities should discourage. If these high-speed lines are fully to justify their existence, they must be made to serve a much larger area than that within the comparatively narrow zone lying immediately adjacent to them, and their greatest and truest usefulness to the cause of economic community development will come through their operation as express lines feeding, and being fed by, the surface system, both in residential and in business sections.

While it was not possible, in years gone past, to foresee the present need for high-speed service, we now know that the demand for such service is going to increase much more rapidly than it can be supplied, unless ways and means are found for providing it at much less cost for construction, operation, and maintenance than is possible at present. In the exhaustive report recently made upon a rapid-transit system for Philadelphia, the Transit Commissioner says that "where feasible, all streets in outlying districts shown as needed for future rapid-transit lines, should be widened to provide the best locations therefor; that all real estate which will be needed by the city in the near future for the development of rapid-transit facilities and which is likely to be improved by the construction of expensive structures thereon, should be secured without delay and that due regard be given to the proper development of transit facilities in future city planning." In discussing the future rapid-transit lines other than those immediately recommended, he says: "In many cases the exact routes are dependent upon the location, widening, or change of grade of certain streets, the building of new bridges or viaducts, and in all cases such future development should go hand in hand with comprehensive city planning." Here, then, is expert testimony and advice from one who has wrestled long and earnestly with a system of narrow checkerboard streets in an effort to find routes for rapid-transit

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lines which would give the service needed with a capital outlay such as a city or an operating company might reasonably be expected to make and obtain fair profit.

The construction of subways is admitted to be necessary in congested city centers and in certain streets which have a claim, either real or sentimental, to some special dignity and distinction, but rapid-transit experts generally agree that the cost is too great to permit of the construction of complete underground systems, and that other methods of construction must be adopted if rapid-transit service is to be provided for all parts of the city. The only substitute for the subway which has been used to any great extent is the elevated, and this is always violently opposed by the owners of property abutting on the street occupied by it; the open-cut subway has been used only to a limited extent.

Subway or elevated lines and surface lines almost invariably parallel each other, and the strict differentiation of their service, one being express and the other local, with a proper coördination of the entire system, would result in the establishment of numerous centers of more or less importance at express stations, and particularly at the intersections of express lines, while the surface lines, operating through streets planned to provide the best possible facilities for such service, would encourage the uniform development of the areas lying between the express lines. Such a system would reach its greatest efficiency in the event of the adoption of regulations limiting the heights of buildings and the occupancy and use of land.

The slow time of surface cars has always been the subject of complaint, and the operating companies have not always been at fault. In the absence of wide, direct highways, routes wind with many turns through streets so narrow that every crossing must be approached with caution, crossing stops are close together, slow-moving vehicles ob-

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struct the tracks, and time is lost in rounding many curves. Formerly the car stopped wherever hailed by a passenger, later it stopped only on the far side of intersecting streets, now it stops only on the near side of the more important streets, and sometime it will be customary to stop only at certain designated points as is the custom in most European and some American cities. The public is gradually being educated to help improve the service, and much greater improvement would be encouraged by the more intelligent planning of streets. Direct routes, less overlapping of lines, more transfer points and longer distances between stops will sometime be appreciated. Time schedules have greatly improved, and could be further reduced if surface lines could be given rights of way protected from obstruction by other traffic and with fewer crossings of intersecting streets. Streets of uniform width, at uniform distances apart, are largely a habit of perfunctory planning, and, if there were a pronounced differentiation between main thoroughfares intended for traffic carriers and secondary or intermediate ones intended for local development, the necessity for very frequent crossings would not exist. Wide traffic streets would afford a better view of vehicles approaching from intersecting streets and good speed could be safely maintained where stopping points were a considerable distance apart even though frequent crossings existed. This would also apply to motor vehicles, and as no part of a properly coördinated system of main thoroughfares would be likely to be seriously congested, the movement of every kind of traffic would be greatly expedited.

The suggestion has been made that in wide streets the railway tracks be not placed in the center but in such location on each side that there will be space for slow-moving vehicles between the track and the curb, and a space for fast-moving vehicles in the center between tracks. The merit claimed for this arrangement is that people approach-

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ing or leaving the car are not required to cross the lines of fast vehicles, and the latter are less restricted in their movements. The successful working out of the scheme would depend upon the extent to which the two classes of vehicles respected each other's rights and territory or were controlled by traffic regulations.

The history of rapid transit in America is a history of intensive crowding, and this history will continue to repeat itself as long as subways are built one beneath another, or one paralleling another, and all aiming toward a common center. Such rapid-transit lines, serving passenger traffic only, must inevitably transport great masses of people from many outlying parts of the city to the central area, and there create an immense and constantly augmented day population for the comfort, convenience and business needs of which no increased or improved facilities for circulation within the central area itself are provided.

Thoroughly economic and satisfactory transportation facilities will not be provided in any city until the street-planning and street-railway authorities work in coöperation in planning extensions and improvements. Some difference of opinion exists among city planners as to which is of greater importance, the street or the railway, but it does not seem that any city would make much progress if it did not have both, and as both are undoubtedly essential they should be considered as directly related and interdependent in any scheme of town planning. Street systems have expanded more or less arbitrarily without any consideration of their practical availability for purposes of general transportation, and the rapid-transit engineers are everywhere confronted with extraordinarily complex and costly work in providing the transportation service now demanded by the public.

Subways, with all their evil influences, are apparently necessary for the service of cities which have not provided

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an adequate system of main thoroughfares for traffic purposes, but those cities which are ambitious for future metropolitan greatness should establish a thoroughly coördinated system of such thoroughfares, not only through new areas to be developed but through areas already built up, and they should be planned with the view of providing efficient, economic, and abundant street-railway service without the necessity, except in isolated instances, of burrowing into subterranean passages.

General Layout of Main Thoroughfares

In very few instances has the selection of the site of a city which has grown to real greatness, or even to large importance, been the result of chance or accident; the location has almost invariably possessed certain advantages which appealed to the founder as requisite for the successful prosecution of some particular enterprise, but his plan seldom went beyond such needs as lay within the scope of his immediate purpose, and extension beyond such needs became subject to the wishes or whims of his successors. Consequently, the original street layout of most cities is entirely inadequate for metropolitan uses. Once established, however, the street becomes the most permanent fixture of the city. In the course of time every structure in the city is altered, enlarged or entirely reconstructed, but it is seldom that the street undergoes any change in location or width, although greater burdens of service are constantly placed upon it.

Although the very first act in building a city is to lay out some kind of a street system, and although a good street system is of first importance to healthy and economic growth, its establishment has not heretofore been presumed to involve any special knowledge or skill beyond that of the

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surveyor or real-estate promoter. In this respect it has occupied a unique position, since all other public improvements have been believed to require, and have received, the attention of experts.

The great importance of the street rests in the fact that it is the natural channel of all the ordinary mediums of public circulation and public service, that it is necessary to the profitable development and use of property, and that only through the opportunities it may offer can there be any broad or general expression of civic art or dignity; and only to the extent to which a comprehensive, well-ordered system of main thoroughfares exists can those functions be performed efficiently and economically.

The natural growth of a city is invariably radial, pushing out in every direction from a common center, unless some insurmountable topographic obstacle prevents. This is a law of communal growth as old as civilization itself, yet the builders of cities, particularly of American cities, have persistently ignored it and have permitted cities to expand mile after mile beyond the common center apparently without sufficient breadth of vision to see that all expansion contributed to the importance of the center and to the concentration there of all the public, quasi-public, and even private activities which come in official, business or social touch with the entire community, and without taking any effective measures to satisfy a constantly growing need for larger, quicker, and more convenient means of intercommunication. Indeed, it has often happened that direct routes which grew up naturally while a district was rural or suburban have been abandoned or obstructed in the spread of urban improvements, and have been superseded by a system of streets projected with the sole purpose of developing private property.

If we take a map covering a considerable area surrounding any important city, we will find a system of roads radi-

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ating from the city to the towns and villages round about it and radiating also between the various towns and villages. These roads usually follow the lines of least resistance and are quite direct, especially between important centers. They began with the first settlements and increased in number and importance as the settlements grew and prospered; at first, perhaps, only forest trails, then wagon tracks, then post roads and turnpikes; now they carry fast motor-car traffic, and many are occupied by high-speed electric railway lines. Such a system of roads represents roughly what the system of main thoroughfares of a city should be, a system connecting the chief center directly with secondary centers of importance and also directly connecting the secondary centers and radiating from them through industrial and residential sections.

Good city development can only be accomplished where adequate facilities for circulation exist, and so we find that in all of the many cities which have given special attention to improved city planning in the past few years the problems of greatest importance have been those of main thoroughfares and street railways, the two primary and inseparable necessities of urban transportation. In the comprehensive and ambitious plan which has been prepared for the improvement of Chicago, the most important and far-reaching feature is the projected system of interior and exterior main thoroughfares, the radiating and encircling lines of which are spread over an area extending sixty miles from the center of the city, and linked up in such a manner that direct routes are established throughout the city and between all the important centers in the area tributary to it which are certain to grow and prosper in proportion with the facilities each will have for direct and rapid communication with the great municipal center and with each other.

Such a system should be planned for every city that is ambitious for a normal and well-ordered growth, for the

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signs of the times point toward decentralization as one of the most effective processes for accomplishing the objects aimed at by all the national and local civic organizations now engaged in promoting campaigns for community betterment along various lines all more or less correlative. Decentralization must not be understood as meaning the destruction of the great municipal center—as that must continue to exist and even grow in importance as typifying the civic dignity and power of the community—but as the discouragement of the drift, toward that center, of commercial and industrial activities not directly associated with official and civic activities. The "zoning" system, or the restriction of the uses to which certain areas may be put, which is now receiving much serious consideration in this country, and the limitation of the heights of buildings would tend toward decentralization, and the successful carrying out of any such measures for limiting the use of land will depend largely upon the efficiency and economy of the street system.

Cities have not nearly reached the limits of their accomplishment in any direction. It is pretty generally assumed that they will continue to grow quite as rapidly in the future as they have in the past, and the most sanguine can only hope that their physical growth may be better regulated and those activities which affect the well-being of the people better controlled than they have heretofore been. Many agencies are now working actively, intelligently, and untiringly toward those ends, and are witnessing the gradual breaking down of the veneration in high places for traditional customs, habits, and policies. In this breaking down there will be instances where the zeal and influence of aggressive enthusiasts may push academic theories too far, and also instances where shrewd promoters will cleverly cultivate a popular demand for the carrying out of pet projects of doubtful or limited public benefit; these influences, together with those which are born of individual selfishness,

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constitute a menace to the orderly and economic working out of the great projects now contemplated in nearly every city, which can be carried to completion only by public support and the use of public funds.

Most, if not all, of the cost of constructing a system of main thoroughfares commensurate to the needs of a rapidly growing community must be paid from the public treasury, for, unlike the ordinary street of only local importance, such thoroughfares serve widely separate areas and are of such general benefit that it would not be equitable to charge their whole cost against a locally benefited area. Big cities are undertaking, in one way or another, to use the public funds to finance the improvement of their street railway systems; and the ownership and operation of these systems, as well as of other transportation and public-service utilities, may in time be undertaken by all our municipalities. These and many other activities touching the public welfare which are being undertaken at public expense are vastly increasing the cost of municipal government, and the sums involved are mounting to such size that cities can ill afford to take risks or adopt arbitrary or ill-considered methods in their public works. Bad planning means not only waste of public money but waste of time and energy of the people. Whether or not we like the modern speeding-up processes, they seem to be essential to American progress and must be provided for; the high-speed vehicle seeks the route over which it can make the quickest time between given points; the motor car at safe and reasonable speed easily beats the surface street car; both these vehicles, as well as all others using the public highways, should have the opportunity of giving the best and quickest service of which they are capable, consistent with the safety of all street traffic, and this is not possible without a well-planned system of main thoroughfares.

Main thoroughfares should be planned in as direct lines

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as possible, but they need not necessarily be straight. Sharp curves and sudden jogs should, however, be avoided and changes in direction should be accomplished by means of curves rather than angles, except where the deflection occurs at an intersecting street; a graceful curve or a well-planned fork will tend to break the monotony of long, straight lines. Topographical conditions should not be permitted to exercise as large an influence upon the alignment as in streets of lesser importance. Detours which would materially lengthen the route should be made only to avoid excessive grades; some heavy cutting and filling is to be preferred over many windings in a great traffic route which may be required to carry the trade of a large city for centuries. The first plan of such a street must usually be considered its permanent one, for it is seldom that its capacity can be increased after abutting property has been built up.

Secondary thoroughfares should be established connecting the main ones with each other and with secondary centers of population and industry, and these two classes of streets should form the primary plan, designed to create direct routes at reasonable intervals throughout the entire city and surrounding districts, without regard for the development of any particular property, but with the intelligent purpose of encouraging an equal distribution of opportunities for improvement.

With an efficient system of main and secondary thoroughfares established, other parts of the plan, covering residential streets and those which can never be of much importance to through travel, should be left as elastic as possible, in order that any legitimate form of development may be accommodated.

In planning main thoroughfares, opportunities should be sought for creating squares, open spaces, and appropriate sites for public or quasi-public buildings. The careful selection and planning of such features, or planning with a

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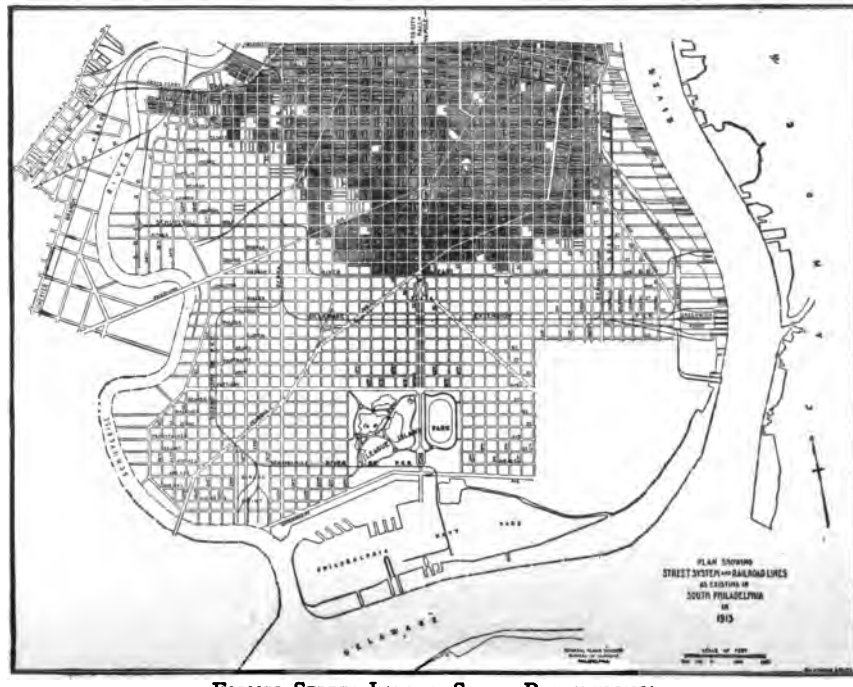

FORMER STREET LAYOUT, SOUTH PHILADELPHIA

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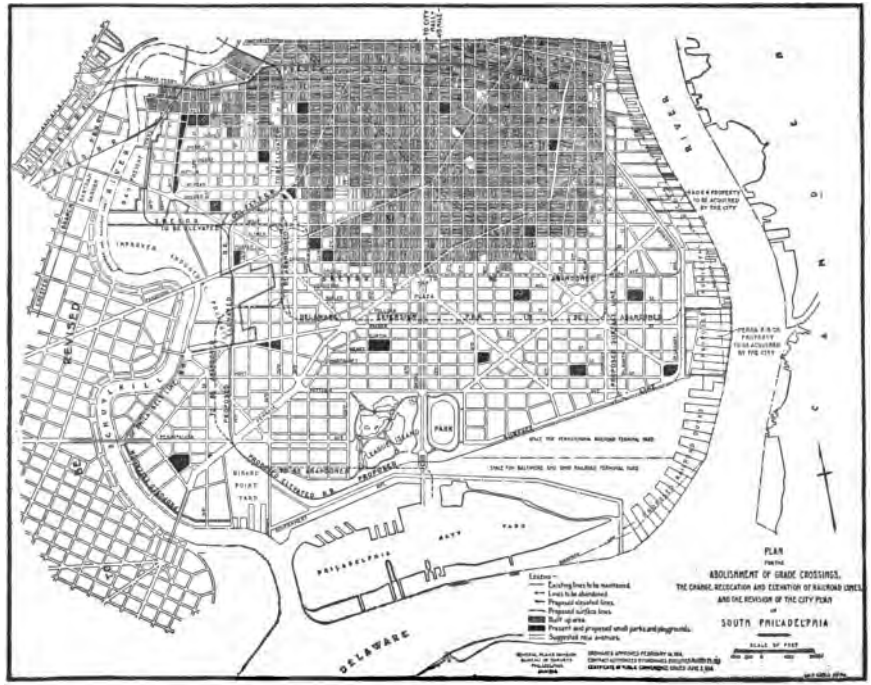

REVISED STREET LAYOUT, SOUTH PHILADELPHIA

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streets, the streets to be so occupied must be planned with that object in view, and must, therefore, be wider than streets planned for the ordinary purposes of city development. It is manifestly unnecessary to plan all streets of widths sufficient for high-speed service, and it is just as manifestly impossible that all street-railway service can be of that kind. Therefore, it seems that there should be two classes of main thoroughfares, one to carry the high-speed lines, subway, elevated or open-cut, and the other the surface lines. It is obvious that the first class will be in the minority and should be planned directly to connect important centers; their focusing toward one important center should be discouraged if concentration and congestion are to be avoided, and their spacing should be generally from one to two miles apart. Their width should be sufficient to permit of the construction of a two-track line of any type, and for this purpose a minimum width of one hundred and forty-eight feet is suggested, with a space along the center sufficient for an elevated line screened by trees, or an open cut with half-slopes, the latter designed for conversion into a covered subway in the event of surface traffic requiring additional space. Streets of this class and for this purpose are now being planned in Philadelphia with a 60-foot-wide center strip, a 26-foot roadway on either side, and 18-foot sidewalks. The 60-foot central strip could readily be made to accommodate a four-track line without disturbing any other part of the street, should such an enlargement be required. Four-tracking would, however, not be required if high-speed lines were confined to their proper function, that of express service, leaving the local and short haul service to the surface lines.

There has been much discussion of the merits and demerits of classification and standardization as aids in the more systematic and efficient establishment of street widths. Both possess some degree of merit and have had a wide

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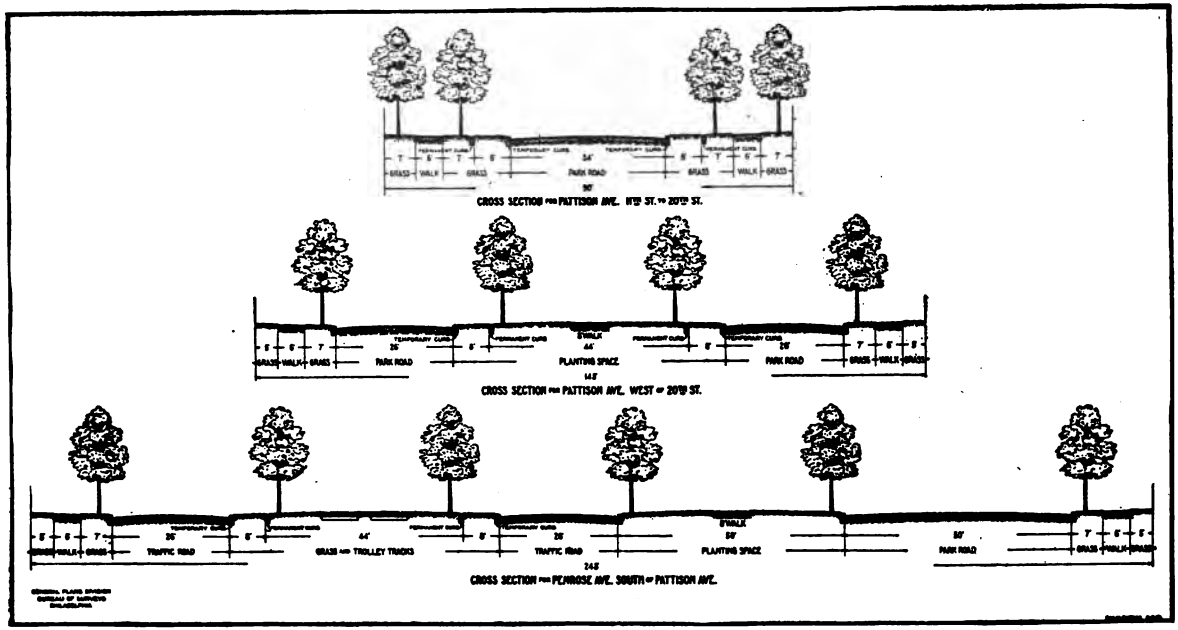

ELASTIC SECTIONS. NOTE PARTICULARLY THE 148-FOOT STANDARD

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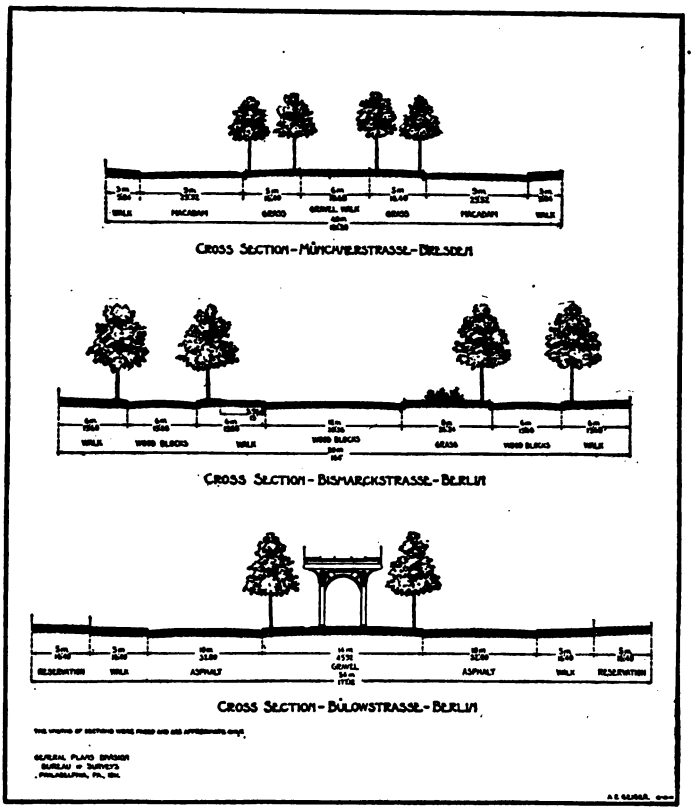
influence, but it is probable that this influence has been the result of habit and custom rather than of deliberate design. Classification is perhaps most evident in European



practice, and standardization in American practice, as indicated by the character and uses of the streets of the cities of France and Germany and the uniformity of widths of those of the United States. In the former there is some special significance in the words alley, street, and avenue, while in the latter a public way which is in fact an alley is often called an avenue. In the former there is much ir-

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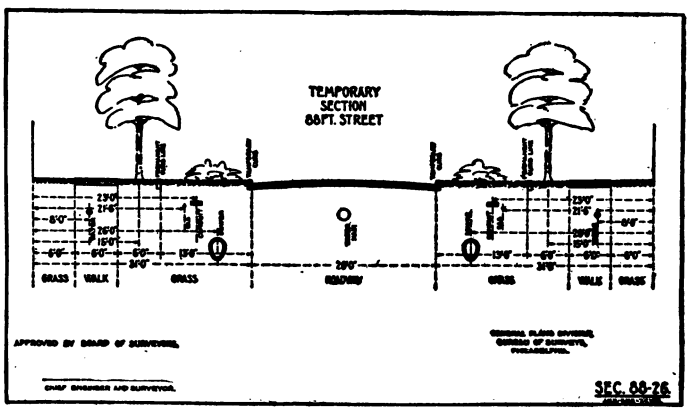
regularity of widths, while in the latter they are uniform and standard, as, for example, the 60- and 100-foot widths of New York, the 50- and 60-foot widths of Philadelphia, and the 66-foot width common to so many cities in the United States and Canada that it can almost be called the American standard.

Most city-planning authorities agree, both in theory and actual practice, that main thoroughfares should be 100 feet or more in width and that secondary ones should be at least



ELASTIC SECTION. STANDARD SECONDARY TRAFFIC THOROUGHFARE

80 feet wide. Streets of these widths involve very considerable expense for construction and maintenance and if too many of them are established the burden upon the public treasury becomes unnecessarily heavy. The general layout should, therefore, be based upon as accurate a forecast of future traffic needs as it is possible to make, the number of them should be kept within reasonable limits, and economic methods of construction and maintenance should be adopted.

The 148-foot width referred to upon a preceding page was adopted, after careful consideration, as appropriate

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in the particular instances in which it is applied, and widths of 108 and 88 feet were adopted for other main and secondary thoroughfares upon the same general plan, which is being made in carrying out a revision of the street system over an area of about 5,000 acres in the southern part of Philadelphia, where a severely rectangular system of streets 50 and 60 feet wide, spaced about 400 feet apart, had previously been projected. The streets 108 and 88 feet wide are planned to accommodate double-track street railways and to serve as through routes for general traffic; the former width is sufficient to permit surface tracks to occupy a separate reservation in the center or to be spaced for the passage of high-speed vehicles between them, and is also sufficient for occupancy by an elevated line if one should become necessary.

The widths of cross-section subdivisions of streets as established under this revision are based upon certain unit widths for lines of traffic. In determining roadways the width for the first two lines of vehicles is based upon a 9-foot unit, and each additional line upon an 8-foot unit, except where the roadway will be occupied by a double-track surface railway, in which case the 9-foot unit is used up to four lines of traffic, beyond which widths are increased by adding two 8-foot units, since the addition of one such single unit upon a double-tracked street with the tracks in the center would not increase the traffic carrying capacity. This practice results in roadway widths of 18, 26, 36, and 52 feet, the latter being considered the maximum roadway width of the 88-foot street, with an allowance of 18 feet for each sidewalk. The 108-foot street is the 88-foot one split along the middle, with a 20-foot reservation for the street railway inserted between roadways each 26 feet wide, the sidewalks remaining the same. The sidewalk width is based upon a 2-foot unit for each line of pedestrians, and is subdivided into a 6-foot paved walk with a

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6-foot grass strip upon each side and with a row of trees 3 feet inside the curb line.

The actual use of this method of street planning is stated to show that it is believed to be sound in principle, but its ultimate merits can be determined only by the test of time and service after the territory to which it is being applied shall be fully developed.

The same units should be used in determining roadway and sidewalk widths upon all streets. In very wide streets the width of the central reservation will depend upon the particular useful or decorative purpose it is intended to serve. Ample sidewalk widths are always desirable, and it is better to take the chance of having them too wide rather than too narrow, particularly in planning undeveloped areas where the opening will not involve great cost. Main thoroughfares will usually be the first ones opened in a new territory, and they should be improved in a manner that will attract special attention and encourage the development of the section they serve. If they become important business streets in the future, wide sidewalks will be a distinct advantage, and if properly planted at the time they are opened, and properly maintained, they will always contribute much to the attractiveness of a fine avenue for either residential or business purposes.

The initial opening of main thoroughfares will usually occur many years before they arrive at their period of greatest importance as heavy traffic carriers, and a very large saving in the cost of construction and maintenance can be effected by the adoption of the "elastic" principle in their opening and improvement. If, in the case of a street 108 feet wide, restrictions could be imposed preventing the erection of any permanent improvements within those lines, the original opening might be only 60 feet wide, with a roadway 26 or 36 feet wide, as such a width is equal to that of our most important and most heavily traveled coun-

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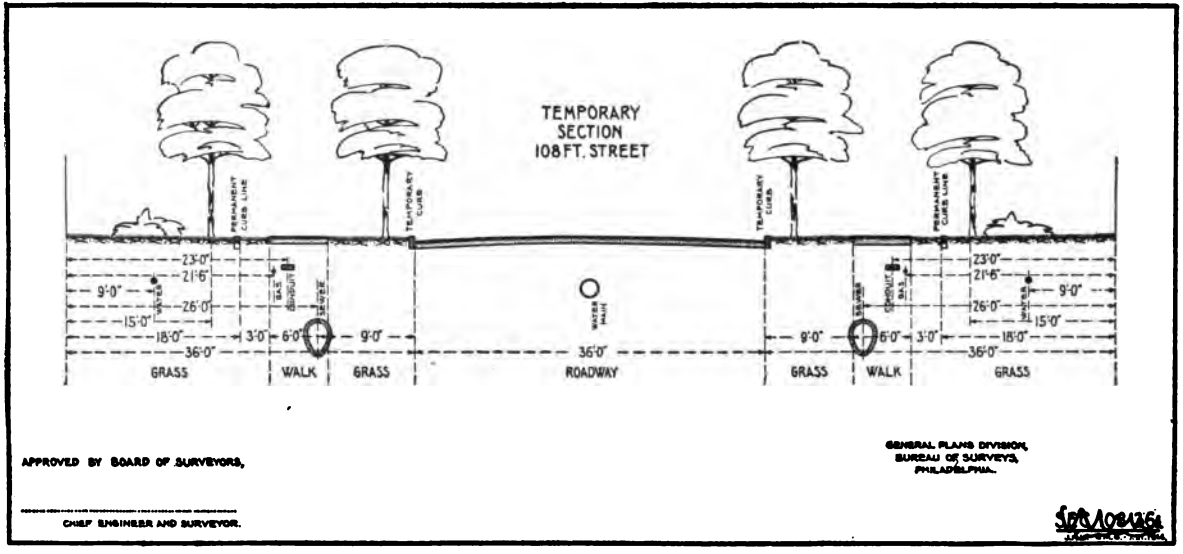

ELASTIC SECTION. STANDARD MAIN THOROUGHFARE, PHILADELPHIA

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try highways. Usually, however, it may be found more advantageous to acquire the full width and pave only such portions as will be needed for traffic within a reasonable period; this would also permit the necessary grading to be done and the planting of trees in their permanent locations, and less disturbance of physical conditions would occur in the event of the subsequent widening of the roadways. The "elastic" street is not a new theory, but a practical measure of economy in many cities, and there are instances where roadways which have been paved and in use for many years have been reduced in width as a measure of economy because they were found to be much wider than was necessary to accommodate the traffic.

With the constantly increasing variety, size, and number of structures required for the underground service of cities, there is as great a necessity for wide main thoroughfares for the accommodation of their trunk lines as for the accommodation of surface traffic. Few citizens realize the vast network of pipes and conduits that traverse the streets, and only those who have charge of the construction and maintenance of such structures are familiar with the difficulty and cost of placing them in narrow and irregular streets. Such structures are certain to increase in number as new and enlarged uses are found for them. The desirability of wide sidewalks for the location of structures having local house connections should be seriously considered. There is generally less occasion to uncover mains than house-service lines, and the placing of the former under the roadway and the latter under the sidewalks would render the constant tearing up of costly paving unnecessary. The cost of house connections would also be much less in wide streets by reason of the service lines lying nearer to the houses, as it is more economical to lay a line upon each side of such streets than to lay a single line requiring very long connections.

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The importance of economic grades is too often neglected in street planning. The experience of the city of Seattle teaches the best lesson of the great unwisdom of heavy grades. If, in the original planning of the streets in that city, certain ones had been selected as main thoroughfares and cut to a reasonable grade the great destruction and cost of the regrading recently done there as a measure of absolute necessity might have been avoided.

In establishing grades, the main thoroughfare should be favored, as to the general grade and adjustments at intersections, over streets of secondary or minor importance. Abrupt breaks and the establishment of pronounced benches or platforms at intersections should be avoided for the sake of appearance as well as service. It is quite possible so to adjust the paving that reasonably heavy grades can be carried through intersections, without detriment to either drainage or traffic; changes of grade should be accomplished by vertical parabolic curves rather than by abrupt breaks.

It is not possible for anyone to foresee just how a city is going to grow or just what the requirements of circulation will be in the future, but it is certain that urban growth will proceed rapidly and that cities will continue to spread over continually widening areas. The present tendency toward limiting the height of buildings and placing restraint upon the intensive use of land will bring larger areas into use. Travel requiring direct through routes for considerable distances will greatly increase, and this should be provided for in a skillful and economic manner by creating a network of main and secondary traffic thoroughfares as the primary element of the city plan.

All the lessons of modern city planning, practical and theoretical, teach us that the city of the future is to be a city where light, air, comfort, convenience, health, and beauty will prevail, as well as a city where commercial and industrial energy, business enterprise, and social and

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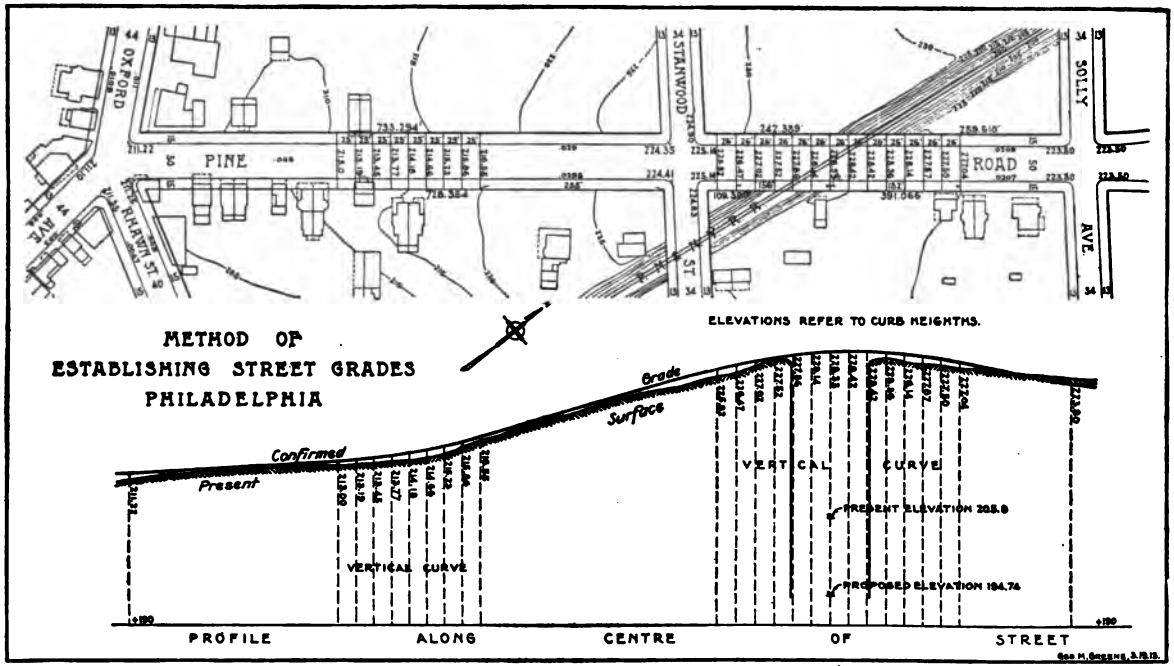

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professional ambitions will flourish and win their rewards. Transportation will continue to be, as it has been in the past, the most potential agent in the growth of cities, and those cities which will serve their citizens best and measure up most nearly to the standard set will be those which early solve the problem of circulatory needs and lay the foundation for their growth upon a well-ordered system of main thoroughfares planned for general service, and designed to accommodate, efficiently and economically, safely, comfortably, and speedily, that particular form of public service most needed and most used by the people in their everyday business and social activities—the street railway.

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CHAPTER XIV

THE EFFECT OF RAPID TRANSIT ON THE CITY PLAN

The very marked increase in the ratio between the urban and rural population which has taken place in the last century is largely due to the application of power and machinery to manufacturing and transportation. On the one hand, this has provided a means of livelihood for large numbers in small areas, and on the other, it has provided a cheap and rapid means of conveying the necessities of life to the city dweller and the output of his labor to a market.

The development of urban centers has been accompanied by a change in the conditions of urban life; the business, manufacturing, and residential areas becoming separated, and suburban areas growing up along the lines of the steam railways.

To a certain point in the development of a city the steam, or trunk railway was adequate for the purposes of passenger transportation to outer districts, but it should be remembered that its primary function is to furnish transportation of freight and passengers between the city and the outside world beyond. It can handle a certain amount of suburban business and even some within-the-city transportation, but when the growth of such traffic reaches a point where it interferes with the railway's primary function, such traffic can be better served and the city more uniformly expanded by the construction of independent passenger lines than by adding facilities to the main line railways. At the same time, the steam railway must neces-

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sarily continue to handle a considerable portion of the passenger business contiguous to its lines within the suburban territory, and to that extent the steam railroad overlaps and performs the functions of what is later described as "rapid-transit" service.

The development of the suburban passenger business of the steam railroads, and the concentration of great populations within city limits, necessitated the provision of means for the distribution of the people within these limited areas of dense population, and, consequently, there were developed, first, lines of omnibus transportation, and, later, lines of street-car transportation to perform local distribution service. The function of the street surface railroad has obviously been to provide passenger service locally upon the surface of streets or private rights-of-way, necessitating comparatively low speeds of operation. In districts of concentrated population this movement has been very slow, although, since the introduction of electric power for the operation of cars, the movement in less populous suburban districts has been comparatively rapid. The operation of cars on the surface of streets in built-up districts becomes a nuisance when more than one car is operated as a train unit, and while in some cities one or more so-called trailer cars may be attached to a motor car, a train of this type is objectionable and introduces increased hazards to public safety and delays to other traffic, compared with the operation of single units.

It has been stated that "the popular conception of 'rapid transit' means train operation as distinguished from single car operation." The same authority states further: "Of course, the horse-cars and bus-lines of early New York constituted 'rapid transit' for those days." In this review, however, consideration is only given to the types of intra-urban transit that are now popularly accepted as "rapid transit." This definition of the term "rapid transit" hardly

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goes far enough, for under modern conditions rapid-transit service may be operated by single car units or by long trains of cars. A better definition of a rapid-transit line is "one that is so placed that speed can be attained without endangering or conflicting with the street traffic," a result which can be accomplished only by building above or below the street surface or on acquired property, with the line depressed or elevated at cross streets. The recent development of rapid transit is due to the fact that the urban population has extended its residential and commercial areas, and the distances between such districts and the time for distribution have so increased that it is obvious that in every city a point has been, or will be, reached in its evolution when other means than the service of steam railroads and street surface railroads are needed for quicker and more efficient handling of the local and near suburban passenger service, thus permitting of the extension of the radius of the urban district and thereby distributing the population over the larger territory. With the growth of great cities, the time consumed by each individual in traveling between his residence and place of business constitutes an increasingly large percentage of his total day, and it becomes desirable to reduce as far as possible the time required for this daily transportation.

The steam railroads can operate through trains, for long distances with few stops, at an average speed of 45 miles per hour or more, while their suburban service, with the increased number of stops, operates at speeds of 30 to 35 miles per hour, according to the district served and the frequency of the stops. On the other hand, the distributing street-surface railroads in the sections of a city not closely built up and under conditions of light traffic, operate at average speeds of 11 or 12 miles per hour; whereas, in congested portions of great cities the average speed does not exceed 8 miles per hour. Over a complete run of the

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ordinary street surface railroad in large cities, the cars may be expected to operate at a speed of approximately 9½ miles per hour.

It was obvious, therefore, that there must be provided a passenger service intermediate between these two types of transportation, eliminating entirely the interferences which the steam railroads often had in the existence of grade crossings, and which the street railroads incurred by stoppages at every street corner, and the obstruction by vehicular traffic. Such an intermediate service was necessary in order to furnish transportation which, in speed, would be more nearly that of the steam railroad, but which would be constructed otherwise than at the grade of streets, and which would provide for train stops at definite intervals, according to the average speed to be attained and the necessities of distribution of the traffic.

The operation of city transportation by any line of railroad develops a service upon that railroad which is most convenient to a certain tributary population; and the general tendency of movement by the population of a city over its railroads develops very nearly fixed ratios of transportation for all the different hours of the day, which proportions remain practically constant, excepting in so far as affected by exterior circumstances. That is to say, for practically five days of the week there will be generally a normal percentage of the total transportation handled in each hour. On Saturdays and Sundays similarly there will be a corresponding hourly ratio, but obviously different from that of the other five days of the week. Holidays or other circumstances may materially affect the hourly movement. Different countries or cities may have different load curves, but for the most part in the large cities this curve is closely similar, indicating a concentration of movement of the tributary population between places of business and places of residence.

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The load curve shows great concentration, or maximum density, of traffic "workward" during the period approximately between eight and nine o'clock in the morning, and a still greater concentration, or maximum density, of traffic "homeward" in the evening between five and six o'clock. These two periods are known as the "peak-load" hours of travel, and in some cases they are referred to as the "rush hours." The capacity of the railroad to transport its business is measured by the concentration in these morning and evening hours, and it is the ability of a railroad to handle its peak-load business that controls its capacity as a whole to earn its income. A fair average of the peak load in the morning may be considered as ten per cent. of the total daily traffic in both directions, while the peak load in the evening may be considered as fourteen per cent. of the total daily traffic in both directions. Almost invariably the largest portion of this total peak-load traffic is in one direction, as it is seldom that a railroad is so laid out as to handle equal loads in both directions at the same hours of the day. It is obvious, as the peak load is a reasonably constant factor, that a railroad passing through the business district extending in each direction, and consequently obtaining a more nearly equal load in both directions, can operate its traffic with less car mileage and, therefore, more economically than a similar railroad terminating in a business district.

On Sundays the traffic is not over nine per cent. of the total weekly traffic, while on the heaviest single day of a week it will approximate seventeen per cent. of the total weekly traffic. Similarly, there is in most great cities a very marked difference between the volume of traffic in the summer and in the winter, depending largely on the type of service rendered by each particular line of transportation. In cities where rapid-transit service has been instituted, the increasing habit of the people to use such facilities has been

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very noticeable in respect of what might be called the "riding habit." Taking as an illustration New York City, the increase in traffic has been at an enormously greater rate than the increase in population. In 1860, before any rapid-transit facilities were provided in New York, the traffic reports indicate that there were forty-three rides per head of population per annum. In 1890, after the elevated railroads had been put into full and active operation, this riding habit had reached an average of two hundred and thirty rides per head of population per annum, while in the last year for which returns have been made for the greater city, which includes a great deal of territory where the density of population is light, this riding habit had increased to three hundred and sixty rides per head of population per annum. The patronage of rapid-transit facilities, indicated by these figures, shows the great necessity for which such service was developed and produced.

In all cities that have undertaken the production of rapid-transit service, the aim has been to connect the business district of the city with the outlying suburban district. This furnishing of transportation to the central business district of a city undoubtedly, to a large extent, fixes the location of the business district for all time. The benefit to the extension and development of the outlying and suburban districts has been very marked and noticeable, and values have necessarily advanced to an enormous degree in such sections. At the same time there has also been noticeable in these cities a very distinct depreciation in property values in certain districts immediately exterior to the concentrated business section, as well as inability to utilize such properties for any purpose. A correction of this difficulty can only come in the process of time, as the business district extends and expands to take in such exterior districts.

To produce rapid transit, an essential factor to be considered in construction is the avoidance of grade crossings

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of streets or of the tracks of its own railroads or other railroads, as, due to the close headway and concentrated service necessarily operated on a rapid-transit railroad, it is only by the elimination of such grade crossings that traffic can be safely and expeditiously handled. This involves, therefore, construction on some other plane than the level of the street or public places. London took the first steps in this direction by constructing underground railroads, and New York took a further step by constructing elevated railroads. London and other cities have also constructed portions of their rapid-transit lines on embankments or in depressed open cuts. In many cases, steam railroads, which previously existed on private rights of way at surface grade, have been reconstructed and additional tracks provided upon which to operate rapid-transit service, using electric power in conjunction with the general operation of the steam railroad. In these cases, the electrification has extended from city terminals to points immediately without the urban district, either to obviate the smoke nuisance or to improve the local service. In any case, in the reconstruction of such steam railroads, any tracks equipped for rapid-transit service must be independent of the tracks used for operation of through trains, either in freight or passenger service, whether such are operated by steam power or electric power.

In reconsideration of a city plan to provide for rapid transit, it is necessary, first, to relocate and improve the trunk railroads, as those structures are not capable of the same flexibility in treatment as rapid-transit railroad facilities. Generally speaking, it can be assumed that a properly built and equipped railroad track, whether on surface right of way, on viaduct, steel structure, or in subway, is capable of doing only the same passenger business, or in other words, can serve to operate the same number of passengers per hour. On account of the heavy cost of operation it is

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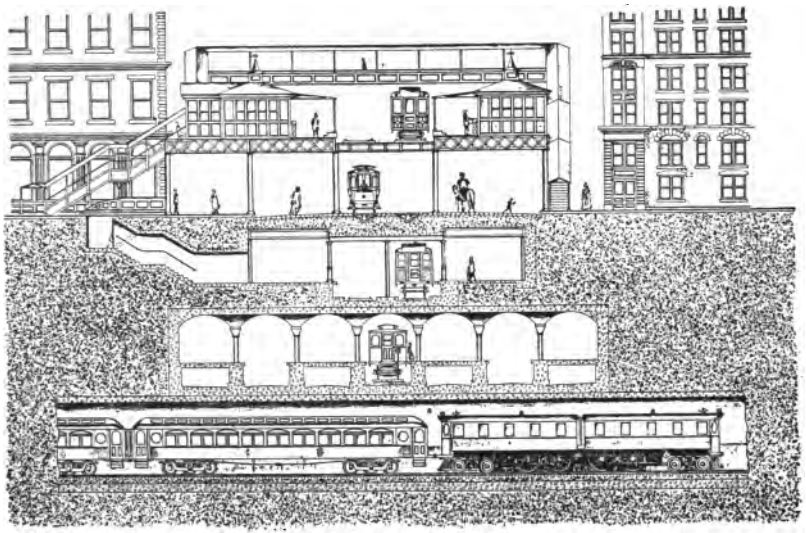

Cross Section on Sixth Avenue at 33rd St.

1 FOOT PASSAGE
2 MANHATTAN ELEVATED R. R.
3 STREET SURFACE AND METROPOLITAN ST. RY.
4 PROPOSED RAPID TRANSIT SUBWAY
5 HUDSON & MANHATTAN R. R. STATION
6 PENNSYLVANIA R. R. TUNNEL

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important, with light traffic, to confine the cost of construction and equipment to the lowest point possible, and it is also susceptible of proof that, with the volume of traffic which can be developed from a city, no project of rapid transit is likely to be a profitable one unless that city has a population of somewhere near one million people. In other words, this indicates that unless there is likely to be forthcoming a great volume of concentrated business, particularly of the class known as "short haul," there is little justification for a city to enter into rapid-transit development unless it is ready to burden itself with large bonded indebtedness in anticipation of extended growth.

The production of structures necessary for operating rapid-transit service involves very heavy costs, and the following table is given to illustrate the average cost of construction of different types of railroad suited to rapid-transit service, including the fixed structural equipment. These figures are given as fair average costs under conditions which would govern in New York City. They do not include the cost of power plants and power distribution, rolling stock or operating equipment, nor the value of property for rights of way or easement, and in each case they are given on the basis of constructing a double-track railroad:

TYPES OF STRUCTURE (*For Double Railway Tracks*)	COST PER MILE OF SINGLE TRACK
Trolley railroad in suburban district, either on public roads or private right of way where no paving is required; complete with overhead trolley construction, track bonded; all in operating condition	$25,000.
Trolley railroad on city streets, including asphalt or granite block pavement for width of tracks	

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TYPES OF STRUCTURE	COST PER MILE OF SINGLE TRACK
(For Double Railway Tracks)	
and 2 feet outside of tracks; complete with overhead trolley construction, track bonded; all in operating condition.....	$42,000.
Underground trolley railroad in congested streets of a city, including necessary pavements, conduits, etc., and with reasonable allowance for changes of subsurface improvements:	
New York.....	126,000.
Washington	48,500.
Elevated railroad of a type and for the loading permissible to meet requirements of Public Service Commission of New York; complete with stations, contact rail, ties, and track; in exterior districts of New York, except Borough of Manhattan; varying with local conditions and details of design.....From	125,000.
to	175,000.
Railroad in open cut similar to Sea Beach Railroad of Brooklyn Rapid Transit Company in Brooklyn, where work is executed with steam shovel and with concrete walls; averaging cost of bridges and stations as part of the cost; complete with contact rail, ties, and track; averages	225,000.
Railroad on masonry viaduct filled in with stone ballast, similar to structure now being erected on Queens Boulevard from Queensboro Bridge to Greenpoint, on Long Island, New York; complete with stations, contact rail, ties, and track; averages	330,000.
Subway such as the Fourth Avenue Subway in Brooklyn, where work is unaffected by subsurface improvements, where the digging is easy and can be done with steam shovel and	

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TYPES OF STRUCTURE (*For Double Railway Tracks*)	COST PER MILE OF SINGLE TRACK
under typical ideal conditions; complete with structural and track equipment; averages.....	$402,000.
Subway such as the Broadway Subway now being constructed in New York City, where the work is very difficult and involves extreme interference with subsurface improvements of all kinds, the support of street surface, trolley car tracks, underground trolley construction, etc.; complete with structural and track equipment; averages	1,190,000.
Iron-lined tube tunnels under waterways or below water level; complete with structural equipment and track; averages.....	2,700,000.

In cities other than New York, where the soil is easier to excavate, where the streets are broad, and where there is no difficulty in changing subsurface improvements, or in outlying districts where the excavation can be taken out by steam shovel, or under improved local conditions, the cost of producing these structures may be materially changed.

In the further development of rapid-transit service, there has become apparent the need of fast service to outlying districts in order to obtain the greatest benefits from the facilities provided. The earlier railroads constructed for this purpose consisted of only two tracks. Obviously, then, no better speed could be made from the outlying districts than was made by a train making all stoppages, if the service was operated in any respect near the capacity of the railroad. The spacing of stations on any type of rapid-transit railroad is an important factor affecting train operation and the development of the district. The desire of those engaged in operating the railroad, viewed from the

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interest of the general traveling public, is to increase the distance between express stops, at the same time throwing a more equitable burden upon the local trains. On the other hand, the common demand by property owners is for an increased number of express stations, which obviously reduces the average express train speed and thereby lessens the utility of the service to be yielded to the public. In the earlier rapid transit development in great cities, station stops were located as frequently as five or six to the mile, and even with the high acceleration of train movement which is possible with electric traction, and the rapid deceleration obtained by modern brake equipment on cars, the speed which can be obtained in service is very limited. Steam railroads doing suburban service had instituted express service to and from the more distant points by providing express tracks and local tracks, and so routing the trains that they might operate as express to certain fixed points and thereafter cross over to the local tracks and serve all local stopping points in the more distant districts. The elevated railroads in the Borough of Manhattan, New York, developed an express-train service which is operated on a third track between the outer districts and the business district, using this third track in the direction of the maximum travel—inwards in the morning and outwards in the evening. In the construction of the first subway in New York, the Rapid Transit Railroad Commission went a step further and provided two tracks exclusively for express service and two tracks exclusively for local service, the express tracks in these cases having stations approximately two miles apart and the local tracks having five stations to the mile. The express stations are used by passengers for transferring between local and express trains, permitting passengers the more expeditiously to reach their destination. This plan of construction and operation has been carried out in all the more recent lines. It should not be

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forgotten that it takes a very heavy and dense traffic to warrant more than a two-track city transit railway, which is the standard type adopted in the cities of Europe, and New York City is the only place in America with an underground city transit line having four tracks, although Chicago has elevated lines with more than two tracks.

Owing to the very great expense involved in the construction of subways or tube tunnels, various cities which have introduced structures for rapid transit have developed more or less composite schemes of construction adapted to their needs, so as to reduce as far as possible the average cost of producing structures suitable to the service. The following is a summary of the several types of such structures:

Tube Tunnels.—In cities where the underlying soil is water bearing, or where it is imperative that construction should be carried on without disturbing the surface, tube tunnels—usually carrying a single track within each tube—are built by the use of a shield, and the lining constructed of iron or steel segmental plates. By this method absolute safety of construction is assured in any kind of soil, and construction may be carried on in crowded districts without the public having ocular knowledge that such work is in progress. The structure is self-contained and, having very thin walls, it can be utilized in narrow thoroughfares. This is also the most advantageous type of construction for passing under waterways.

Tunnels and Subways.—By "subway" is meant a comparatively shallow type of underground structure, built open from the surface, the surface being subsequently restored to its original condition. The cost of this type of construction is so great as to warrant its being used only in districts where the population has reached a condition of practical saturation, or in commercial districts where the population enters and leaves in great numbers. Tunnel subways may be built by tunneling methods deep below the

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HUDSON TERMINAL, NEW YORK CITY

. SEA BEACH LINE, BROOKLYN RAPID TRANSIT CO.

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surface, and even in tiers if the traffic of a city warrants it. In such cases the routes taken can be independent of the surface topography and of the lines of streets, passing under private property upon easement for transportation purposes only. This proposition for limited use of private property necessitates a better understanding as to the value of easements below the surface, where the surface property is not in any way interfered with or disturbed, which will enable a railroad to acquire such easements at reasonable expense for the construction of high-speed transit service. The subway is exempt from all difficulties due to climatic conditions; the equipment is protected and there is no interference from exterior conditions; the surface of the ground remains intact and free for any development required for street conditions.

Open Cut.—This method of construction necessitates retaining walls and construction at a depth which will enable highways to be carried over such open cut on bridges. The cost is less than for subways, and passengers travel in greater comfort. One advantage over an elevated line is the comparative quietness of train operation. Such a structure, however, must of necessity be located on private property, although, if a street is of great width, such a structure might be built and later, as the city grows, be roofed in to form a subway.

Viaduct.—Viaduct, with masonry and solid fill, was the earliest type of construction of steam railroads through European cities. In streets it forms a serious obstruction. Upon private right of way it had advantages, particularly in quietness of operation and low maintenance cost.

Elevated Railroads.—The cost of a steel elevated structure is reasonable. In a narrow street, where the structure is within a few feet of the houses on either side, an elevated road is somewhat of a nuisance, but built on a broad thoroughfare it is not really objectionable, and the noise from

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operation may be reduced by building a solid track floor of reënforced concrete. Notwithstanding the usual objection to these structures, the record in New York and Brooklyn is that property values have appreciated, and have maintained their appreciation, to a greater extent along elevated lines than nearby and adjacent properties where there are no elevated structures, so that it can be fairly assumed there is no material property disadvantage in the construction of an elevated road. Elevated railroads interfere little with the street surface and provide rapid-transit service at the smallest cost, thereby enabling suburban districts and districts of light population to obtain the advantages of rapid-transit service which they could not hope to obtain if the alternative was the construction of subways or masonry viaducts.

Until a city has grown to considerable magnitude, there is no necessity for the provision of rapid-transit service. During this growth the development is usually along the original transportation lines, and this early development is influenced largely by the city's topography. Later provision of transportation for distribution must necessarily follow the natural earlier development. The growth of a city is usually irregular in plan, and the later provision of rapid transit consequently becomes more difficult to apply. In the growth of a city the business area and district have probably been of narrow extent with considerable congestion. Provision of rapid-transit facilities in a small area of congestion is liable to increase that congestion rather than relieve it, and the centering of rapid-transit facilities upon a business district should be provided not to a single point, but to a number of points covering a considerable and extended area, so that the lines of travel may tend to increase the dimensions of the area of business congestion. The theoretically perfect provision for rapid transit in a

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ELEVATED RAILROAD, CONCRETE MASONRY VIADUCT

ELEVATED RAILROAD, STEEL STRUCTURE

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city would take the business district as a central circle and radiate from that district, in every direction, lines having large facilities nearer to the central circle and tapering out to lesser facilities in the outlying suburban district, effecting what, in diagrammatic form, would be a star with many points. To obtain this a general rectilinear layout for city streets, with broad diagonal avenues radiating in straight lines from the central section, appears to yield the most perfect results. In a growing city it is desirable, as early as possible, to plan for such a result. Large breadth of street is necessary for surface travel as well as for future provision of rapid transit, and within the arms of the star the landscape architect could have free hand in developing an irregular and artistic design of streets, which may be desirable for local conditions.

In preparing a city plan for future development of rapid transit, it should be borne in mind that for a four-track subway a street of 100 feet width is necessary, while a two-track subway can be accommodated in a street of 75 feet width. Street provision for elevated railroads should, on account of light and air and other easements, allow 80 feet width for two tracks, 100 feet width for three tracks, and 120 feet width for any possible four-track structure.

Straight streets for rapid-transit facilities are most desirable, although curves having easy radius are not particularly objectionable in operation nor do they add very appreciably to the initial cost. It must be noted, however, that the operation of each new provision for rapid-transit or transportation facilities, changes the character of a city's growth and thereby materially affects the development of a city's plan, and advances in the art of transportation may have the same effect. As an illustration, when New York City was laid out, the waterways were the main arteries of travel and the cross streets were laid out at short inter-

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vals, while the north and south thoroughfares were laid out at long intervals. Water transportation has become almost an unimportant factor, and the street plan in consequence is far from the best for the present development.

In the development of a city's plan, the entire elimination of any terminals for rapid-transit service within the business district should be considered essential, as operating lines should extend in from the outer districts, pass through the business district, and extend out again to the exterior section of the city. True facilities for transportation within a city are best obtained by the provision of main straight arteries for rapid-transit service from a central district to the outlying suburbs, and from the various stopping points on these radial lines provision for local and subsidiary distribution should be by means of surface cars, motor busses, etc., but such a theoretically typical plan must of necessity be largely modified by the conditions which develop in each case, which have to be treated and must be largely influenced by the local topography of each individual scheme presented.

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CHAPTER XV

RESIDENTIAL AND INDUSTRIAL DECENTRALIZATION

Concentration of population in urban areas has increased at a rapid rate during the past century. The population of cities has grown in part from births to the indigenous population. But the invention and production within the cities of agricultural machinery and other labor-saving devices have made possible a growth of the urban population at the expense of the rural. The superior social and industrial opportunities of cities have brought a continuous stream of people from country to city. Furthermore about three-quarters [1] of America's immigrants from Europe have settled in cities. Few municipalities have planned intelligently for this rapid urban growth. Buildings have been crowded upon the land, and people have been crowded within the buildings. Urban living has become in many ways inconvenient, unsafe, and unhealthful.

As each urban community grows, new buildings are erected on old house lots or the homes of its original or semi-rural citizens are "converted" for use by several families. Often, also, barns and other outbuildings are made over for housing purposes, or the old buildings are torn down and displaced by tenement houses. Each worker in local trades and industries desires to be close to his work. Transit facilities fail to develop much in advance of demonstrable

[1] In 1910, 72.1 per cent. of our foreign-born population were living in urban communities (incorporated places of over 2,500 population). Abstract of Thirteenth Census, p. 200.

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need, so the population becomes crowded within a limited area, and becomes accustomed to living on streets which are paved and treeless, and in houses which are bare, monotonous, and depressing. It becomes used to living a life quite divorced from nature. The responsibilities of home ownership are felt only by the few. The sense of citizenship and the sense of moral responsibility for evils suffered by neighbors become weak. The product is a race increasingly artificialized, selfish, and apathetic.

In the interests of both hygiene and public morality, the cottage home is very much to be preferred to the tenement dwelling. When an urban population lives in tenement houses, large numbers of persons are crowded within a limited area, which involves a continuous traffic, through the tenement streets, of residents and their visitors, and for the delivery of goods. The traffic is noisy, which fatigues the nerves of sensitive tenement dwellers. It further stirs up a large amount of dust consisting of mineral and organic matter prejudicial to the health of persons that breathe it. The common hallways, cellars, and yards of the tenement house serve as a medium of transmission of many of the diseases of the families congregated there. This danger is reduced somewhat by providing windows to light and ventilate the halls, but is not eliminated, because many portions are remote from the sun's rays, and quite inadequately aërated. Tuberculosis is responsible for nearly one-tenth of all deaths in the United States, destroying life usually between the ages of twenty and forty, at the period of greatest productivity. The tubercle bacillus can live for weeks outside the human body in a sunless, damp room, hall, or cellar. The tenement house frequently contains germs of tuberculosis in large numbers, and they may be borne in the dust of the hall to the lungs of fresh victims. The tenement house may thus at once reduce vitality, through relative absence of sunlight and fresh air, and may

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provide abundant opportunity for transmission of prevalent and dangerous diseases.

Tenement houses, furthermore, do not insure that privacy which is essential to the highest degree of human, mental or moral development. Tenements are constructed close together, so that the affairs of one family are readily visible from the windows of neighboring apartments. Privacy can be secured only by shutting windows and closing curtains—at the sacrifice, that is, of light and air, which are indispensable elements for maximum functional health. Solitude is difficult to secure even in the better-class apartment houses, where one is close to the sounds of musical instruments or other noises of many neighboring families. The most serious indictment against the tenement house is, however, that it makes impossible proper supervision of children by parents. The child for its own health must play out of doors. But when the tenement child leaves its apartment, it is beyond parental supervision, may associate with any of the persons, desirable or undesirable, that the tenement house or tenement street may have brought together. Its choice of games, like its choice of playmates, is beyond parental control, and its time is likely to be spent in harmful ways.

The cottage home does not share these disadvantages. On cottage streets the amount of necessary traffic and, thereby, of noise and dust, is very much less than prevails in tenement quarters. There is no common hall through which to share in the diseases of neighboring families. Each home is insulated by open space. Fire and accident dangers are also less in the cottage home. The amount of available privacy is increased, for neighboring families live farther apart, and they may have at the same time solitude, light, and air. Most important, however, is the opportunity provided for the mother, the chief agent of moral education of the young of the race, to supervise her children,

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who may play in an open back yard, with associates known to the mother, and at games chosen or watched by the mother while she is at work in her kitchen. The cottage dwelling also makes it possible for the breadwinner to develop a garden outside of working hours, which gives relief in most cases from the day's work, makes possible the raising of fresh vegetables, often at a cost less than that entailed in purchase from the markets, and provides opportunity as well for nature education for the children. Not less important is the fact that the cottage home when owned tends to develop in the family a sense of responsibility, both for its own premises and for the neighborhood in which it dwells. This sense of responsibility reacts in local politics to the advantage of the community by rendering its citizens more conscientious in both private and public action.

There are two groups of social policies which are especially important as means of inducing industrial workers of our cities to live in cottage homes. The first of these may be termed industrial decentralization; the second, residential decentralization. The policy of industrial decentralization involves measures to remove factories and workshops from cities to suburbs or to the open country. Residential decentralization involves the measures which remove city dwellers to suburbs, or to small towns, villages, or farms. A policy of residential decentralization might, therefore, include all measures within the city which penalize tenement construction—e. g., laws requiring the tenement houses to be fireproof throughout but permitting frame construction of single-family dwellings—measures which promote cheap and rapid transit, measures which reduce the purchase price of suburban land, measures which facilitate the borrowing of money cheaply for cottage construction, and "back-to-the-land" movements.

The industrial opportunities which cities afford constitute

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one of the chief causes of rapid growth in America. Manufacturers have established their plants in cities chiefly because there they were close to the labor market, to transportation facilities, and to the consumer. Both the unemployed and the ambitious move to cities because the opportunities for regular employment there seem greater. This industrial population has been largely responsible for the unhealthy crowding of American cities. If these industries could be removed from communities now crowded, to open land, if new industries could also be induced to establish themselves in open country, and if the industrial population could be enticed from the city to these new industrial villages, the characteristic housing ills of America would be largely reduced.

There are many arguments of an economic character for industrial decentralization. Factory land in cities is very expensive; land can be had for industrial uses in suburbs or in the open country at slight cost—sometimes at no cost. Communities may be chosen where tax rates are lower than in the city, and often a rural board of trade will find it advantageous to give the land and remit taxes for a period of years, for an incoming industry. Transportation facilities for the products of some industries are unquestionably better in the cities, but this relative advantage in favor of the urban community may disappear when special tracks are constructed on the outer boundaries of our cities, connecting large railway systems. In an urban center, most industries must charge a large fraction of their gross income each year to the transportation of goods to and from the freight yard, for expense of drivers and vehicles, for waste and breakage occasioned by much handling, etc.—expenses which may be eliminated altogether when the industrial establishment is situated by a spur track, where it may load the freight cars at its very door. Labor costs may be lower in the rural community, if labor is less well unionized than

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in the city, or if the cost of living is lower. If industrial decentralization is accompanied by residential decentralization as well, if the tenement dwellers of the city are moved into cottage homes with gardens, the health, contentment, efficiency, and permanence of labor may be greater in the industrial village than in the city, which will result in reduced loss to the employer from irregular work and from slackness in work.

The program of industrial decentralization is not one easily applied to all industries. Its actuation depends upon the nature of the industry, the size of its urban environment, the availability of labor supply, and various other factors. Industries which cater to the citizens of but a single city, such as laundries, tailor shops, dressmaking establishments and millinery shops must remain in the city to be close to the consumer, or will in any case be among the last to move. The seasonal trades must be close to a large labor supply, and cannot generally move to rural communities until, at least, an effective system of national labor exchanges is established. Industries which have already invested largely in urban property will also find it difficult to uproot and reëstablish in the open country. The process of industrial decentralization is, therefore, necessarily slow, but the aim is nevertheless important, and can be promoted by national and state organizations or commissions for the improvement of housing, as well as by suburban and rural boards of trade.

Industrial decentralization unaccompanied by residential decentralization is of slight value in meeting the housing problem. Graham Romeyn Taylor, in "Satellite Cities," shows a number of cases in the Middle West, in which industrial workers have remained city residents, traveling daily to and from the rural place of work. This is altogether unfortunate and unnecessary. Experience proves that it is possible to develop industrial villages as units, applying the

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best of city-planning principles to their construction, and that it is possible to house the employees in homes that are hygienic, artistic, and private. But to do this, it is essential either that the employer of labor himself buy up from fifty to several hundred acres about his own factory, or that this be done by some special organization of citizens. The first method only has been tried out on an extensive scale in America.

Experience demonstrates that employers of labor can buy large tracts at a very small cost per acre, and that they can, with the assistance of competent city planners, subdivide this land and plat it, with winding residential streets served by accessible commercial and social centers, at a slight cost per lot. They can design cottages for the whole area or a fraction thereof, and build them at one time, involving purchase of material by the carload or train load from wholesaler or manufacturer, at low cost per unit, thus providing well-equipped cottage homes in a pleasant industrial village at a rental which the worker can afford to pay.

When an employer undertakes to house his employees in such villages, it is generally wise for him to build some houses to rent, and others to sell on easy installments—payments running over a twenty-year period or longer. He should also reserve a few of the house lots unbuilt, which he may sell on easy terms to employees who wish to design and construct their own homes. The employer should be careful to permit his employees to choose whether they will rent or buy, and should compel no employee, directly or indirectly, to live in his houses. If he permits them to live wherever they please, they will have no occasion to feel themselves the victims of patronage, or in any undesirable sense subservient to their employer. An employer who respects the individuality of his employee in this way is not likely to suffer largely from labor troubles.

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One other means of industrial decentralization has been tried in England. A book by Ebenezer Howard called "Garden Cities of Tomorrow," first published in 1898 under the title "Tomorrow," urged the establishment of industrial cities of limited population by limited dividend corporations of public-spirited citizens. Howard recommended that such cities be limited to a population of about 32,000. Each was to be surrounded by a belt of agricultural land; the number of houses per acre in the industrial quarter was to be limited in each city. The land was to be the property not of the employer who moves his factory to the garden city, but was to be held by trustees with the proviso that the land might become the property at will of the citizens of the community. Howard hoped by promoting the establishment of such garden cities to decentralize industry, to cause the abandonment of old cities, and to secure for every citizen of England the advantages both of rural life—fresh air, cottage homes, and gardens—and of city life—good schools, churches, theaters, and social centers.

In 1903, 3,818 acres of land were secured about thirty miles out from London, at Letchworth, England. This land was purchased by the Garden City Pioneer Co., Limited, at £40 an acre. The Pioneer Co. then dissolved, and the First Garden City, Limited, which now owns the land on which the city is built, was created. The constitution of this society provides that dividends of only five per cent. shall be paid on shares, and provides further that the citizens of Garden City may purchase these shares and own their town whenever they so desire. A special quarter in this city is reserved for factories, so situated that the prevailing winds will carry smoke away from residences. The factory zone is hidden from the rest of the town by a hill, and is crossed by a railway which runs direct from London to Cambridge. Already more than thirty factory owners have been induced to establish their plants in this town.

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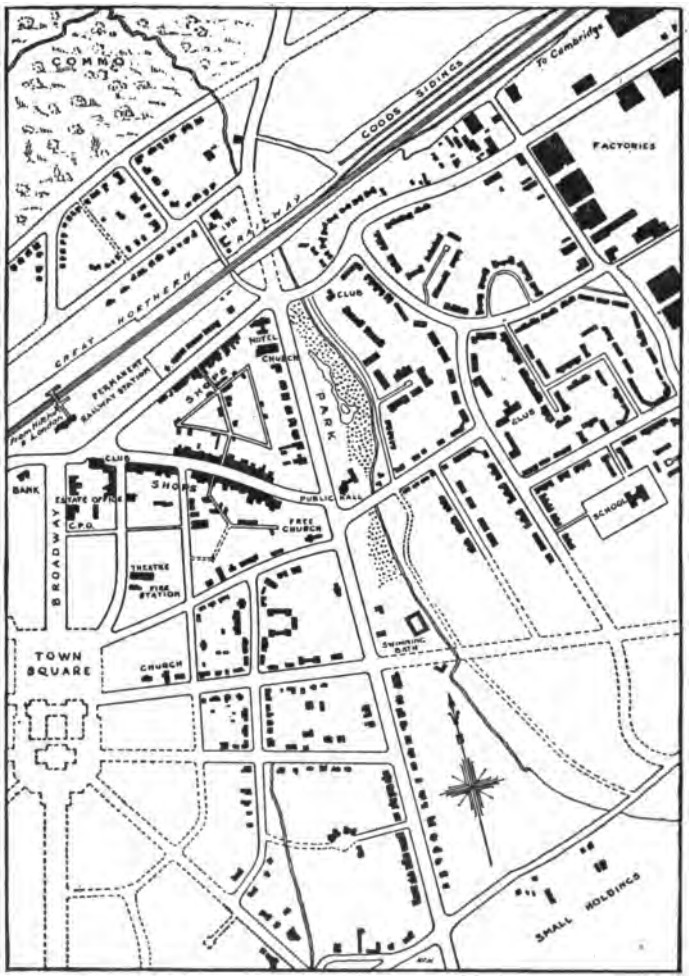

PART OF LETCHWORTH GARDEN CITY, ENGLAND

Over two-thirds of the outlying area is reserved for a permanent agricultural belt which shall provide fresh food for the city and share in its social life. The present popu-

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lation consists of about 8,000 people, housed in cottages detached, semi-detached, or in rows. The maximum number of houses which may be erected per acre is twelve, thus providing a generous garden for each house. In addition allotment gardens may be rented by any householder. Rents for houses and land are low, and industrial workers are all much better housed than in the city. The town is beautifully planned and well kept, and its citizens public-spirited. By the application of Howard's scheme a decentralized industrial community is established, providing all of the advantages of the industrial village owned by employers of labor, and none of the disadvantages. This method has not been widely tried as yet, but is promising, and is important enough to warrant careful trial in America under the guidance of a competent body of citizens, conscious of the urgency of this problem.

The policy of residential decentralization is important in our cities, whether industry is decentralized or not. If industries should be moved out of cities and the workers should follow, the problem of residential decentralization for the rest of the urban population would become relatively simple, for a large amount of accessible land would be rendered available for a limited population. But whether industries are removed or not, it is important for a city convinced of the relative superiority of the cottage home to promote cottage dwelling by special measures. Obviously the city workman cannot generally live in a cottage home in the suburbs unless he can go from his home to his work in a period of half an hour or less. Also, he cannot ordinarily live in a cottage home if his rent or his monthly payment of interest, amortization, etc., toward house acquisition will cost him more, daily carfare included, than the rent of equivalent accommodation in a tenement house in the city.[1]

[1] Exceptions are various. If there is less sickness in the suburbs he can pay a rent equivalent to his city rent plus his savings on

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The question is somewhat more complicated than would appear from the above statement, for often many members of a working family are engaged in work in the city, in which case the location of the home must be determined with reference to the needs of those members who work farthest away or for the longest hours. The absence of social advantages in suburbs also impedes suburban living. Hence, a factor in the solution of this problem must be the provision of accessible educational and recreational facilities for all age and sex groups of the population in the residential suburb.

To make suburban residences accessible, it is important to devise cheap and rapid transit to all outlying portions of our cities that are fit for use as residential districts. It is important for this reason, as well as for vehicular traffic, to have direct, broad radial streets from the commercial, industrial, and social centers of the city to the suburbs.

The cost of suburban homes as generally constructed in America, is prohibitive for the working classes. The houses are built singly, at retail prices for materials, labor, and loans, often by men ill acquainted with the means of reducing construction costs; they are built on lots of ill-adapted shapes, purchased from land speculators at excessive prices, and upon streets unnecessarily wide and expensive in their construction. To reduce house costs it is necessary, therefore, first to cheapen land costs. This may be accomplished in part by zoning, e. g., the establishment of purely residential districts, for districting limits the speculative value of land. It may be accomplished further by cheapening street costs by planning narrow, semi-rural roadways in purely residential districts, and by designing house lots

doctors' bills. In the suburbs less may be paid for vegetables, drink, dress, amusements, etc.; that which is saved in these ways—if there is no compensating increase in suburban living costs and income remains the same—may be applied to rental.

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somewhat shallower than those now provided in typical American cities. Land may often be cheapened, also, by taxing vacant land at the same value as neighboring improved land—taxing it, that is, for its potential value in use. The low tax rates upon vacant land today serve as an inducement to the land speculator to hold his land idle. If the valuations on this land were increased, landowners would compete to sell their land, thus somewhat reducing the cost per house lot. The cost of borrowed money may be reduced per house where large corporations are borrowers and large sums are sought for extensive operations. Or money might be loaned by city or state governments to individuals or cooperative associations of tenants, following European precedent, provided this policy promised to accomplish good results which would outweigh the evils involved in systems of governmental subsidization. Suburban estates, however financed, should be planned by expert city planners and built with all the economies of large-scale operations in the purchase of materials and labor.

There are four important forms of social organization which may be utilized for the large-scale development of suburban estates: (1) The commercial agency, which develops such estates for profit to the exploiter; (2) the philanthropic agency, which develops such estates primarily for the interest of the tenant, and which does not seek to make money upon its investment; (3) the coöperative agency, through which organized tenants develop the estate in their own collective interest; (4) the government agency, which develops such estate for the public advantage, generally without thought of monetary profit upon the investment. The demarcations between these four agencies are not sharp. Commercial agencies may be philanthropic in the sense that they find it good business to consider the best interests of the tenants or ultimate purchasers. Philanthropic agencies, on the other hand, are increasingly commercialized

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because they find that charity which is to avoid pauperization of the recipient must be conducted in a business-like manner. Most of the so-called philanthropic companies now building suburban estates are limited dividend companies designed to pay five per cent. cumulative dividends upon the invested capital, giving over all further earnings to the occupants of houses in the form of utilities of one sort or another. Coöperative agencies are actuated by the philanthropic principle of service, and at the same time by a desire for maximum profit upon the investment consistent with the welfare of the tenant members. This object is "self-help through service." All of the above agencies may be promoted by the governmental agency—either the municipality or the state—which offers cheap land, tax exemptions, cheap loans, or other special favors, to companies that are building sanitary homes for the poorer classes.

Examples of the commercial agency for cottage construction will be found in every growing city. Philanthropic societies of the limited dividend type have also built to sell or to rent in many American cities, e. g., the City and Suburban Homes Company, Homewood, Brooklyn; the Sanitary Improvement Co., Washington; the Goodyear Tire and Rubber Co., Akron, Ohio; and the Modern Homes Company, Youngstown, Ohio. Industrial corporations, the purpose of which may be either philanthropic or commercial, have built largely for their employees in many countries. Examples of the coöperative principle are rare in America, although this form of organization is likely to be tested in Billerica and East Walpole, Mass., and in Hamilton, Ontario. Coöperative housing has proved decidedly successful in Harborne, Hampstead, and other copartnership garden suburbs of England. Governmental suburban development has been carried on by the County Council of London, and it has been practiced by hundreds of European municipal governments: e. g., Sheffield, England, and Ulm, Ger-

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many. It has been practiced by national and provincial governments in Ireland (Congested Districts Board), New Zealand, and Germany.

Any or all of these agencies may under certain conditions be utilized to advantage for the development of suburbs. The commercial agency is most generally active, for the hope of profit is a perpetual stimulus to house construction in growing communities. The houses built for the man of small means are, however, less well built and less well designed than those constructed by the other agencies, for the aim is generally to secure the utmost immediate profit to the investor. The occupants' interests are considered only

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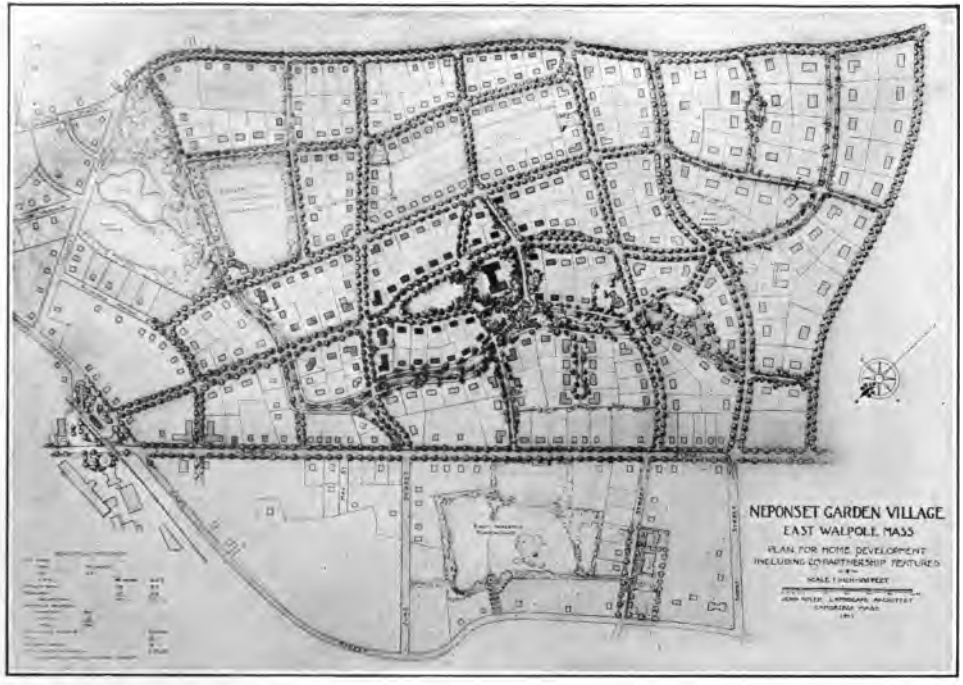

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in so far as it pays to consider them. The commercial agency is an inevitable agency of house construction as long as the institution of private property remains, but it should be supplemented in most cities by other forms of organization.

The philanthropic agency or limited dividend company can be utilized to advantage for purposes of experimentation in new types of construction. The prime function of the philanthropic agency aside from experimentation is education. Education may take the form of instruction of local builders in new building methods, instruction of tenants in the upkeep of their premises, or instruction of house occupants in thrift, through devising new and easy methods of house acquisition. The major function of this agency is probably the discovery of new types of houses, and the sale of these houses on easy payments to tenants. Thus, the City and Suburban Homes Company in Homewood, Brooklyn, has built houses on lots 40 feet by 100 feet, to sell, including lot, for $2,500 to $3,000. The tenant may pay by easy installments running over a period of twenty years, paying his installment for interest, taxes, and amortization monthly, and paying at the same time premiums on an insurance policy equal to two-thirds the value of his mortgage, so that, in case of his death, the company may be protected in the sale of this house and the family may be protected in the house ownership.

Governmental agencies have not been utilized in the United States as yet for the development of suburban estates, but in Europe huge suburban tracts, purchased by municipalities, are developed with low-cost houses which are rented by the municipalities to workmen, or are sold to them by easy installments covering long periods. This latter method has proved useful as a means of preventing undue speculation in suburban lands, and as a means of promoting home acquisition by poor men. Constitutional

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difficulties and relative inefficiency or dishonesty of municipal officers have made it inadvisable to attempt the application of this method in this country as yet. A near approach, however, to this method is made in Toronto, Canada, where the securities of a limited dividend company are guaranteed by the municipality.

Coöperative organization, which has not yet been tried out on a large scale in America, has peculiar virtues as a means of promoting suburban development. Under this method the prospective suburban dwellers might invest in shares of stock of a coöperative housing company. An option on suburban land would be secured. The tenants for the estate would be canvassed throughout the municipality on which it borders. Money for such purposes in both England and Germany may be borrowed from the State at 3 per cent. or 3½ per cent. interest, and further money is obtained by issuing loan stock (non-voting preferred stock with a prior claim on the land and houses of the estate). The estate, of course, should be developed by expert city planners, the advantages of large-scale operations being secured. When the houses are ready, the members of the copartnership association, all of whom would be prospective tenants, would move into their houses and pay rent to the society. The gross income of such societies consists in the rents paid. From this gross income the expenses of the estate are met, interest is paid on money borrowed from the government or on loan stock, a percentage is laid aside for reserve capital, and then interest is paid upon the shares of each tenant member at a limited rate of interest, usually 5 per cent. All the net profits remaining after the above payments may be allocated to members in proportion to the rents which they pay to their common association, but are returned to them not in the form of cash, but in the form of capital stock, until each owns a share of the estate of $1,000 or the value of his house.

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The voting on the affairs of the copartnership tenants' suburb is strictly democratic. Each stockholder has one vote, and one only. This form of organization is peculiarly stable and economical, because each member has a maximum of interest in the affairs of the estate. There are, therefore, no losses from vacancies, for, when a house is vacant, every member of the estate is interested in securing new tenants. The costs for repairs are kept at the minimum, for tenants are careful of property which they own in common. There are few, if any, losses from arrears in rents, because the shares of the tenant can be seized to wipe out his indebtedness to the association. Furthermore, under this form of organization, all increases in site values created by the community become the property of the tenant members.

If the decentralization of residences and industries is conceded to be desirable, it is important for America to stimulate the movement by special measures. Establishment of a national agency to provide information to intending builders, or persons whom they employ, on the relative merits of existing methods of planning, financing, and organizing suburban estates is needed. This same agency might create or enlarge its clientele through propaganda. Exhibits of building materials, of house and estate plans and their relative costs, and of the constitutions, by-laws, and working methods of house-building companies should be provided. By the organization of such a clearing house for advice and propaganda the city planner or the promoter of improved suburban or industrial housing would be able to act upon full knowledge of the results, good and bad, of prior experiments—could profit by past experience. Haphazard experimentation, which results in needless failures, could be avoided. Thus, by slight expenditure of effort, the quantity and the efficiency of schemes for decentralization can be notably increased.

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CHAPTER XVI

FUNDAMENTAL DATA FOR CITY PLANNING WORK

Formerly, the almost universal practice among public or private corporations, in the conduct of their business, was to follow along those lines of development which personal experience or local precedent had shown to be sufficient for meeting possible contingencies or new needs in the ordinary course of growth. New enterprises and developments were undertaken on faith, or only when the need had become so pressing that economic losses were acutely felt. The modern method is radically different. Improvements are planned as the result of careful surveys and detailed analyses, and after a full consideration of all contributory factors bearing on the case.

Similarly, in city planning, a frequent practice has been to provide for transit extensions, street widenings, enlarged port facilities, sanitary improvements, or new park areas, to meet a popular local demand, or to favor certain individuals or corporations. The modern, scientific method is to weigh all improvements on the basis of urgency after a careful survey and analysis, in which consideration is given to all coördinate features in the city plan.

In other words, it is now realized that the city is a complex organism, so complex that no doctor is safe in prescribing for it unless he has made a thoroughgoing and impartial diagnosis of everything that may have even the remotest bearing on the case. City planning is, therefore, fast becoming a well-defined science with definite prescrip-

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tions for definite ills, and satisfactory results can be arrived at only by applying modern scientific methods.

In the collection of the fundamental data for city-planning work, the area included within the boundaries of a city may generally be studied from two main angles. First, comes the older section with its heritage of narrow and overburdened streets, its property under private ownership devoted to uses that reflect the individual policies of individuals or corporations, its inadequate facilities for recreation, amusement, education, and the manifold amenities of city life, its insufficient or neglected provisions for sanitation and health, etc., which, taken all in all, constitute grave obstacles to wholesome living for the existing population. Second, follows the undeveloped or only partially developed territory which offers, at the present time, an almost virgin field for the application of far-sighted methods of control and development through the provision of new arteries, of methods of districting or zoning, of limitations on the height and distribution of buildings, or in the allocation of areas for parks, playground, school sites, or other public uses.

In the first phase, in the old and built-up sections, the city planner will devote his attention to the collection of fundamental data that will aid him in healing the pressing ills of the community, having in mind the need for immediate relief and the practical limitations on radical reform due to the restricted financial resources of the city or the lack of statutory or constitutional powers, while, in the second instance, in the undeveloped territory, he will conduct his investigations and survey in a way that will take into due consideration the time when the population of the city will have grown to two, three, or four times its present numbers, and when the development of streets and transit lines and of private and public property will have extended so as to include all of the undeveloped territory within the

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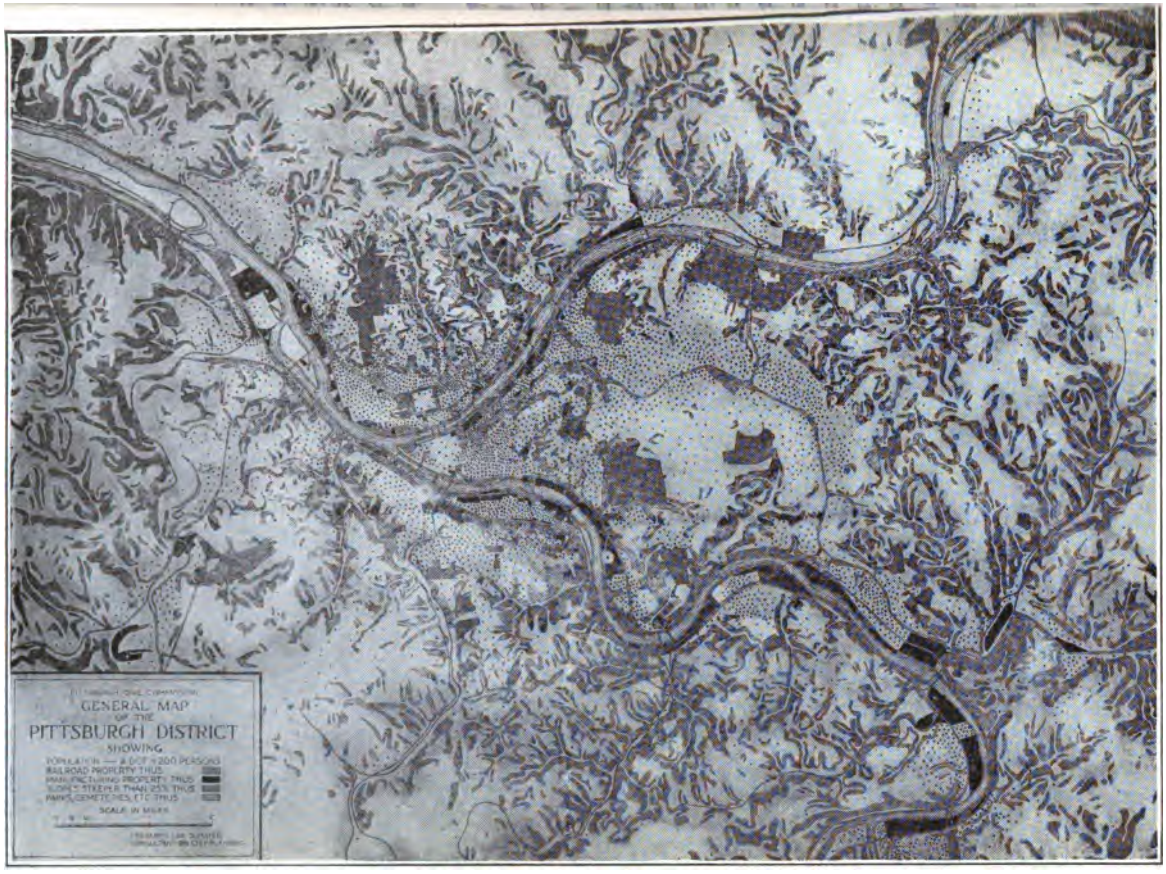

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existing boundaries and probably much of the territory lying miles beyond.

The survey and collection of fundamental data must include, therefore, a consideration of the immediate needs of the city, as well as those which will arise when the city's population will have doubled, trebled, or quadrupled, and its area extended proportionately. Bearing this in mind, the following outline of a program for a survey will suggest many opportunities for such a division of study in approaching a specific problem.

The field for investigation and survey, in its broadest aspects, then, includes (a) the geography and climate of the region, (b) the topographic and hydrographic characteristics of the site, (c) the demographic features of the problem, including such matters as the growth, distribution, and health of the population over a period of years, (d) the history of the city's physical growth, gathered from the available records of the past, (e) the methods of control of development schemes, including constitutional and statutory powers, local restrictions on land and buildings, and the exercise of the police power for the health, safety, morals, and welfare of the people, and (f) the financial status of the city, with a review of the possible sources of revenue.

Geography

The geography of the city and the region which is immediately tributary to it is the chief determining physical quantity of the problem. The natural features, such as heights and depressions and the water front (ocean, river, or bay), form natural barriers to development, determining to some extent the means of communication and the character of the city's commercial development through its docks and harbors, its railroads and canals, and, too, the

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healthfulness and accessibility of housing and recreational developments, the location of factories, and even the method of sewage disposal and the character and source of water supply.

A topographic map of all these features, as well as an accurate presentation of the artificial boundaries, such as the established city limits, and the subdivision of the city area into blocks and streets, will be essential. Such large areas as reservations, parks, institutional grounds, and sites for public buildings will also be shown. Such a map, drawn with the greatest accuracy, based on triangulation methods, with bases and permanent benches, permanently fixed and determined for all time, and showing contours at frequent intervals, is a fundamental desideratum. Strange as it may seem, in many of the largest and wealthiest cities of the country, not to mention the lesser ones, such a record, kept up-to-date, does not exist. A special bureau should be established and intrusted with the drafting of a reliable record of the city area and its boundaries, on which all other surveys should be based. The complexities which are constantly met with in the extension or development of new areas or the fixing of new alignments within the city's territory, would thus be avoided.

Then, too, as modern transit developments are eliminating artificial barriers, cities are daily coming to a fuller realization of the necessity of giving consideration to the means of communication between the major city and its lesser satellites, so that a topographic map of the environing region is of immediate importance.

Geology, Botany, Meteorology

Data showing the character of the underlying soil of the region, the extent of the rock floor, the extent of sub-

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surface water, and the kinds of shrubs and trees best suited to the soil, should be obtained. Data on climatic conditions —the extent of rainfall, atmospheric variations, the directions and intensity of the prevailing winds, etc.—will aid us in studying a number of features of the city plan, such as the best location for factories, the kind of building materials suited to the climate, and the capacity of sewers to carry off storm waters.

Local History

The study of local history will give us a more intelligent grasp of our problem, and for that reason we should have as many maps, charts, and diagrams gathered from all sources showing the early and later aspects of the city's development as we may be able to collect. Further, we should have a record of the period of the city's founding, the characteristics of its population, of its changing occupations and industries, and the varying means of circulation—turnpikes, highways, etc. Not infrequently the city planner may form a better conception of the needs and characteristics of the people for whom he is planning by studying the history of the town than by any other way. The sociological conditions and the economic aspects of the city are brought into clear relief by this method, which, by comparison with a survey of present conditions, will enable him to forecast future growth with considerable accuracy.

Demography

A study of vital statistics—the distribution and health of the population—has been said to be the foundation stone of all city-planning work. To attain the proper perspective in this regard, we should possess records for several dec-

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ades in the past, perhaps fifty years if the information is available. Knowing the facts as to the ever-changing distribution of population and its health—past and present—we are in possession of information that will give us excellent ground on which to make our forecasts for the future.

Population Maps.—The distribution of population, as noted from the Census records, should be plotted on large-scale maps, one dot to every five, ten, or twenty-five people. We should have maps showing the distribution of population during the working day, as well as data giving the kinds of occupations and the numbers in different employments. With the distribution of the sleeping population plotted, as taken from the Census records, and the day distribution as above, we are in possession of graphical data that will be of much assistance in studying the problems of circulation in the city, in the provision of highways and transit lines adequate to meet the daily ebb and flow, and in providing for proper terminal facilities and for scientific districting or zoning, to say nothing of many other uses.

Health Statistics.—The number and distribution of cases of tuberculosis, typhoid, and other contagious diseases of major importance, of infantile mortality, etc., should be a part of the permanent record of every city, kept up to date. If we can secure such data for five-year periods from past records, we may with great advantage plot conditions as shown. These data plotted on maps, with a distinctive sign for each disease, form a telling record in regard to those areas where infection, unsanitary conditions, low vitality, etc., are prevalent, and should call for immediate study on the part of the city planner.

We will have occasion to speak more in detail of the value of these topographical, historical, and demographical data to which we have referred above, in our treatment of the various phases of the general problem, whether in its

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static aspect—in housing, industry, or recreation—or in its dynamic expression—in transportation and the circulatory system. It is only when each of these phases has been studied in connnection with the facts above mentioned, and then treated with reference to all of the others, in the light of effect and countereffect, that we arrive at a point where a real city plan is a practicable objective.

Specific Phases of the Problem: The Static Factors

Residential Areas.—In matters that affect the housing of the people, our investigations will require a complete and graphic expression of the facts extending as far back as the housing records of the past permit. Using our topographic map of the city, enlarged to a scale of sufficient size to represent adequately the facts in considerable detail (200 feet to the inch would give ample space for every feature), we should represent thereon the housing conditions, showing in distinctive colors the one-family, two-family, and tenement houses, whether detached or in rows, with the number of stories and the percentage of lot covered, differentiating the wood and brick construction. The local real-estate atlases or those published for the fire-insurance companies may be used for this purpose. Going back to our vital statistics to which we have referred, we may superimpose on this map the location and number of cases of typhoid, tuberculosis, and infantile mortality in the city, for the past five years or more, representing each case by a dot. It would be well at the same time to represent by symbols the location of every well and privy in the city, data for which will be a part of the record of the health office. All property in the city which remains undeveloped could be distinctly shaded or colored on this map, as representing possible areas for housing development.

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The preparation of several other maps, of smaller scale and with as great detail, showing the general character and extent of housing development some fifty years ago and for such intermediate periods as would best illustrate the tendencies of growth, would be of the greatest help in studying the probable extension of lines of future development in residential property.

These maps afford, by a comparison of building developments in the past and present, and by study in conjunction with the street, transit, industrial, recreational, and property value maps, of which we will speak at a later point, a fairly sound basis for making plans for improvement. The prevalence of tuberculosis, for instance, in certain blighted or run-down districts, will point to the need of a careful survey of housing conditions—overcrowding, congestion, dark rooms, and general dilapidation in structural conditions; the need of greater open space for sunlight, air, and recreation; the possibility of condemning certain areas for park purposes, or of cutting through a new street to relieve the situation and supply a real traffic need. The data in regard to typhoid and infantile mortality will aid us in locating sections where sanitary conditions are particularly bad, especially with reference to water supply, wells, pumps, etc., and with reference to contamination by sewage, yard privies, school sinks, and other objectionable features of the tenement district. The distinction between brick and wooden dwellings will lead us to proposals in regard to restrictions on property, the extension of the fire limits, and the modification of the building laws, etc. The map, in conjunction with the other property maps which we will describe, will be particularly valuable in studying the possibilities of districting or zoning for the city. If we superimpose the population dots on our housing map, such an addition will prove illuminative and valuable in many connections.

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Sanitation.—A full knowledge of the facts in regard to water supply, sewage disposal, garbage disposal, and street cleaning—matters which vitally affect the statistical record in regard to the healthfulness of the population—is essential.

The facts in regard to the distribution of *water mains,* their size and gradients, the districts which they serve, the cost to the consumer, the conditions of ownership of the sources of supply, and the potability and relative purity of the water, should be noted.

In regard to the *disposal of sewage,* we should know just how it is disposed of, how the disposal affects adjacent communities, the extent of sewage mains and their size, and whether the storm water is cared for in these mains, or whether a separate system is provided, and if so, just how extensive this system is and what is its capacity.

In the matter of *garbage disposal* many American cities find the most vital health problem in the community. A knowledge of the methods of collection, the frequency and extent to which all parts of the city are served, the cost to the city, and the methods of disposal—whether by dumping, incineration, or sale to farmers—will be required.

Efficiency in *street cleaning* touches the problems of health and general city attractiveness to a notable degree, and no pains should be spared to secure an adequate knowledge of the quality of service which the city secures, the volume of refuse collected, its unit cost, and the extent of territory served. A personal survey will make possible a fuller realization of the city's needs in this respect.

The data in regard to water supply, sewage disposal, garbage disposal, and street cleaning must, of course, be studied in connection with the problem of housing, as there the effect of these is most notable. For this reason, the superimposing of mains and routes, and notes as to their

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size, on the large housing map, will avail much in showing the effect of inefficient service in certain districts.

Recreation and Education.—In studying the general healthfulness of the residential districts, we are brought into immediate touch with the way in which the city cares for the leisure time of its inhabitants. The problem is related to the general efficiency and healthfulness of the population, and bears on the extent of morbidity and mortality among adults and children. For this reason, its study in connection with congestion, overcrowding, immorality, juvenile delinquency, crime, and street accidents, gives it an important place in our program of investigation.

We should plot on a large-scale map the location, size, and land values of all *playgrounds,* whether public or private, and of all schools, whether with or without yards or playgrounds. In conjunction with this, the plotting of the homes in which juvenile delinquency has occurred, and the sites where street accidents have occurred for five years past, will prove illuminating in illustrating the need in sections now unprovided with playgrounds.

The location of all *parks,* their acreage, cost to the city, average daily usage, and usage on special days, and the location and size of all parks of limited use, especially in connection with institutions and administrative buildings, should be shown on the map, together with all *parkways* or *boulevards,* showing the general arrangement for pleasure traffic and for leisurely pedestrian usage. The city planner will, of course, find his attention drawn to studies for greater efficiency in the use of these areas and for the possibility of extensions in park lands to provide for immediate needs and future growth.

Data should be collected and plotted showing the location of all *social centers, music and lecture halls, libraries* and *collegiate institutes,* the aim of which is to provide for the wise use of adult leisure time.

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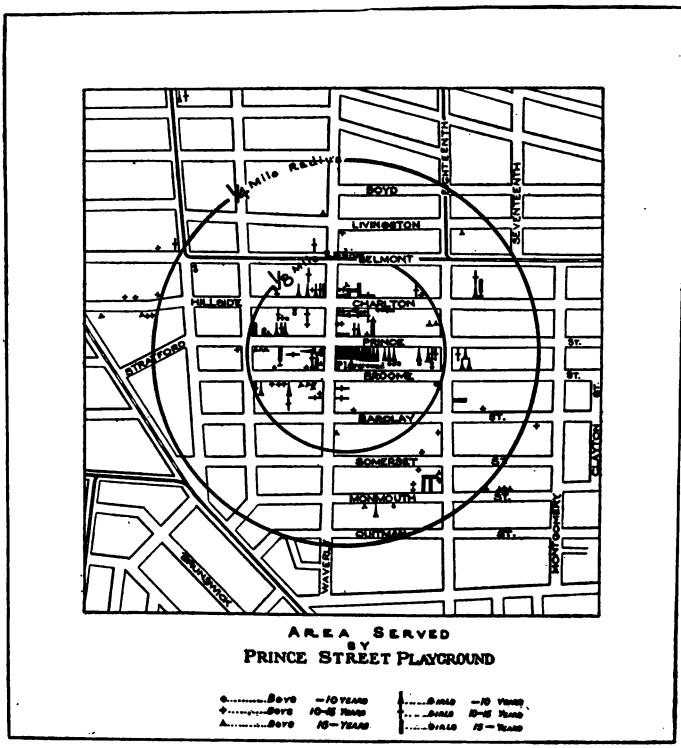
The effect of *commercial ventures aimed at providing amusement* and recreation for adults and children has an important bearing on our city-planning proposals, and for that reason we should study and plot the location and patronage enjoyed by moving-picture theaters, vaudeville



The city planner will find his attention drawn to studies for securing greater efficiency in the use of areas used for recreation and for the extension of facilities, both in playgrounds and parks. The diagram shown herewith illustrates the method by which the effective radius of usefulness of a playground is determined and shows that the homes of the majority of users of this particular facility are located within a circle of ⅛ mile radius.

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theaters, dance halls, saloons, social clubs, etc., with the aim of securing a better understanding of the effect of these on the present provision which the city has made, and for the possible future care of that part of the population now using these by amusements under civic direction—music, drama, moving pictures, and neighborhood centers.

Civic Architecture and Decoration.—Because of the moral effect of noble civic buildings and of the esthetic treatment of utilitarian street furnishings, the study of these, with regard to their adaptation to use and to the higher standards of art and architecture, will form a useful part of the survey. This will cover all public and semi-public buildings, whether municipal or federal, churches, libraries, schools, station-houses, etc., and the architectural treatment of the environing buildings. In the matter of libraries the possible effective radius of use should be noted; in the matter of schools, the effective radius served and the treatment of the grounds from a landscape standpoint. The location, use and area of buildings, and the surrounding grounds, should be plotted on the large-scale map for study in regard to possible rearrangement by grouping, in neighborhood centers or otherwise, or for providing for future growth.

Accompanying the survey of civic architecture, observations should be made in regard to such civic decorations as statues, monuments, fountains, bridges, and utilitarian street furnishings, such as lighting, telegraph or trolley poles, fire-alarm boxes, hydrants, kiosks, street signs, public-comfort stations, and trolley stations, with a view to studying their esthetic effect, appropriateness in design, and effective location. In regard to lighting standards, data might well be collected at the same time showing the height of the lighting fixtures above the street, their distance apart, lighting radius and cost to the city, and distribution, with a view to their more effective placing.

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Property Used for Industry.—We have given a brief outline of the fundamental data required for a study of two of the major factors in the static aspects of the city plan —the housing of the people and provision for the use of leisure time. A third is that of caring for the industrial or commercial activities of the population. The fundamental data required for adequate planning of areas so used divides itself into that dealing with the manufacturing, the wholesale or warehouse, and the retail or business districts.

As mentioned in our section on demography, in this chapter, the distribution of the working population will be plotted on a large-scale map. It will now be necessary to add to this data the location of all factories, showing the number of stories and size of plants, differentiating among plants devoted to light manufacturing, heavy manufacturing, and to industries which, because of noise, odor, or other objectionable features, should be assigned to special locations.

In addition, we should have on the same map, in distinctive color, a plotting of the location, number of stories of, and percentage of lot covered by all *warehouses, wholesale houses, loft buildings,* etc.

For the study of districts devoted to *retail business,* we should show in a special color all shops, miscellaneous small stores, banks, and department stores.

In this case, as well as in the two preceding, we could plot to good advantage, for such periods in the past as the data is readily available, corresponding matter for comparison with the present, to show the tendencies of growth and change.

It is useful to make a general map showing the prevailing *heights of buildings* in different parts of the city.

It is useful also to plot the prevailing *percentages of lot covered* by buildings.

It is essential to plot for the whole city, land-value zones

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based on the *assessed valuation* per front, or per square foot of the typical inside lots.

One of the primary objectives of city planning is the division of the city area into districts in which buildings of a specified character of use or occupancy, and limited to a specified height and percentage of lot occupancy are permitted. Obviously maps of the character shown above in which the prevailing percentages of lots covered by buildings are noted is of the greatest value in a workable program of this sort.

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The importance of all of the above maps cannot be overestimated, especially when they are studied in connection with the problems of transit to and from places of work, and in connection with the study of districting restrictions for various types of housing, manufacturing, and business. It is the linking up of residential and industrial areas by adequate streets and transit facilities, and at the same time securing for industry all the factors that make for efficiency, and for housing, those that make for healthful and convenient living, that constitutes the major element of city planning.

Dynamic Factors in the Problem

The investigations which we have suggested up to this point as essential have touched only on the matters relating to the static elements of the plan. Those features which relate to the ways by which people pass from point to point within the city or are transported beyond its limits, or by which goods are hauled between terminal, warehouse, factory, shop, or home, will require detailed investigation.

Streets.—As a primary factor in circulation, the streets should be studied from the standpoint of use and topography—width, grade, surfacing, and arrangement. As an adjunct to this, the territory in the city not yet subdivided, through which future streets will be run, should be studied with the same points in view. The topographic maps referred to in an early part of this chapter will be of great use in this study.

In the study of the use of streets, the volume, composition, and direction of traffic at important street intersections and traffic throats throughout the city should be noted by special investigators assigned to these points, who will check off the number and direction of pedestrians, of pleasure and light business vehicles, and of heavy draught

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vans, whether self-propelled or horse-drawn. This data is tabulated for each hour of the day and graphically illustrated on charts showing the volume and direction of vehicles at street intersections by broad lines or bands whose breadth is proportional to the number of vehicles, and whose direction indicates whether the traffic moves straight ahead or takes a right- or left-hand turn. Such traffic counts will enable the planner to adopt plans appropriate to the peculiar composition and direction of the travel observed, such, for instance, as (a) the elimination of left-hand turns at intersections, (b) the removal of encroachments on sidewalks, (c) the widening or narrowing of sidewalks, (d) the creation of one-way streets or (e) of parallel streets in groups of two or three, assigned, respectively, to the three major types of traffic—automobile, light-vehicular or surface-car, and heavy trucking, (f) the widening or extension of old streets or (g) the cutting through of new streets. Beyond these special studies, the planner will make himself thoroughly familiar with the entire street problem throughout the district, where it may not be practicable or desirable to conduct special traffic counts, with a view to discovering how far the present street system may be improved in any of the ways above referred to, or by a more economic and rational linking up of the arterial and secondary street system of the city with those highways and minor roads leading out from the city to the tributary territory and townships beyond its boundaries.

As an aid to this study, the maps referred to under *Local History,* showing the early and more recent development of the city's street system, should be collected and compared with the present topographic maps to ascertain the general tendencies in regard to circulation and to become familiar with the direction, continuity, and width of all arterial and secondary highways or such as might be developed if properly aligned and widened.

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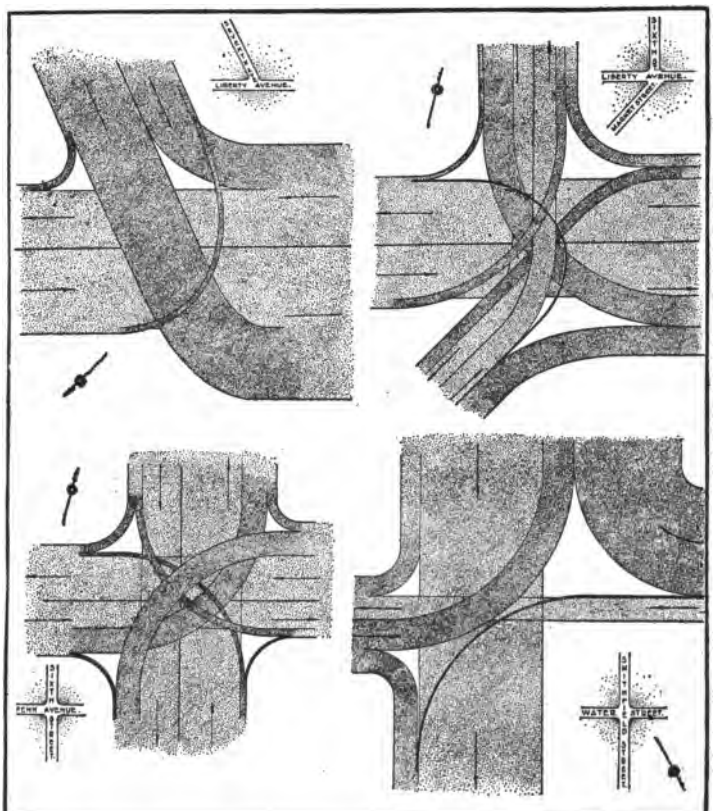
Personal surveys should be made, data collected, and maps prepared of the entire street system from the standpoint of the *roadway and sidewalk surfacing and grades.*



The dynamic factors in the problem are those which relate to the ways by which people pass from point to point within the city or are transported beyond its limits, or by which goods are hauled between terminal, warehouse, factory, shop or home. The volume, composition and direction of traffic at important street intersections and traffic throats throughout the city are studied as an incident of the investigation of street conditions, the results of one such study being shown above.

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On account of the effect of grades and street surfacing on the economic handling of merchandise by trucking, and on the general comfort and convenience enjoyed by vehicular passengers, this study bears a very important relation to securing efficiency in the city plan. For this reason, the data should be plotted on maps, wherever possible, showing the kind of surfacing used on arterial and secondary highways and the grades and crown of the same, and the kind of surfacing on minor roads and residential streets, with a view to determining their adaptability to use. In conjunction with this, we should know, in regard to these layouts, the life and original cost of the pavement, the cost of maintenance, and the method of paying for renewals. For a general view of the whole problem, we should have figures showing the mileage of city streets of various widths, surfacing, and usage. In regard to curbing and gutters we should note the character of construction, general appearance, and wearing qualities of typical streets throughout the city. Data similar to that in regard to street roadways should be collected in regard to the uniformity, smoothness, life, cost, etc., of all sidewalks.

Transit.—Adequate transit facilities for connecting the housing, industrial and recreational areas within the city are of fundamental importance. Rapid transportation has given rise to the rapid increase in population and area of all modern cities, and still controls the growth and extension of urban communities. The historical maps which we have collected will illustrate the distribution of early transit facilities, omnibus, horse-car, cable-car, and surface electric lines, and will be useful, in connection with the corresponding maps showing housing and industry, in enabling us to judge of the probable future needs. In addition, we should show on a large-scale map the present transit lines—(a) surface lines, whether double or single track, noting the width between track centers and the width of car

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in use, (b) elevated lines and stations, (c) subways and stations, and (d) any other types. This map, superimposed on the map showing the street areas, will give the distance between car tracks and curb lines, and, superimposed on the map showing the distribution of population, the density of districts served by each transit line.

But, beyond this, it will be necessary to make detailed *traffic counts* for transit lines throughout the city in order to make a just estimate of future needs and of methods for increasing the efficiency of existing lines. Such a study for a normal day is made by observers placed on every fourth or fifth car of every line, during practically the entire day, who make records of the trip of each passenger, the time of day, route of car, direction, whether inbound or outbound, street at which passenger boards the car, the street corner to which he is destined or the route on which his destination is located (if reached by transfer), the fare presented, whether cash or transfer, and whether transfer is taken. Observations should also be made at important points in the city at rush hours, noting the number of passengers aboard every car passing the point and the number of vacant seats.

To make this data available for study in regard to the *need of new rapid-transit lines,* the city may be divided arbitrarily into a gridiron of squares called traffic sections, each covering one square mile or less. From the tabulation of the figures collected by the investigators and from data ordinarily compiled by the operating companies, we determine for each traffic section the rides originating on the day of survey, the equivalent revenue for the year, the rides per capita per annum, and the revenue per capita per annum, which, studied jointly with the population, density, and acreage of the section, gives us the basis for estimating the probable use and income from new transit lines through those sections which are at present inadequately served.

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To study the *density* of the daily ebb and flow along main traffic routes of the system, charts may be prepared from the data in hand showing (1) the volume of traffic flowing, during a normal day, toward the center of the city or point of delivery, by means of broad bands of widths varying in proportion to the number of passengers aboard at intermediate points along the route; and showing, by similar methods, (2) the volume of traffic flowing to the outskirts of the city along the principal routes.

Apart from density of traffic, however, factors of importance to the rider are the *time in transit* and the *cost*. For the graphic illustration of the time required to reach the focus or point of delivery from all points in the circumferential area, contour lines at one to five minute intervals are drawn through all points in the city from which riders reach the focus or city center in equal times when traveling by the quickest available routes, whether surface car, elevated, subway or steam roads, and including walking up to about a half-mile from each station.

For a similar graphic illustration of the fare charge which the rider is required to pay to reach the focus or point of delivery from all points in the circumferential area, contour lines are drawn through points from which riders reach the focus at equal cost (five, ten, fifteen cents, etc.) when traveling by all available routes.

Both time and fare zones may be colored between contour intervals, which, in connection with the population map, tell a graphic story as to (1) what districts are having comparatively quick transit and what are in need of immediate provision for more rapid means of communication with the business center of the city, and (2) what sections are getting comparatively cheap transit and what areas are deprived of opportunity for normal development by expensive riding and consequent diminution of intercourse with the city's center.

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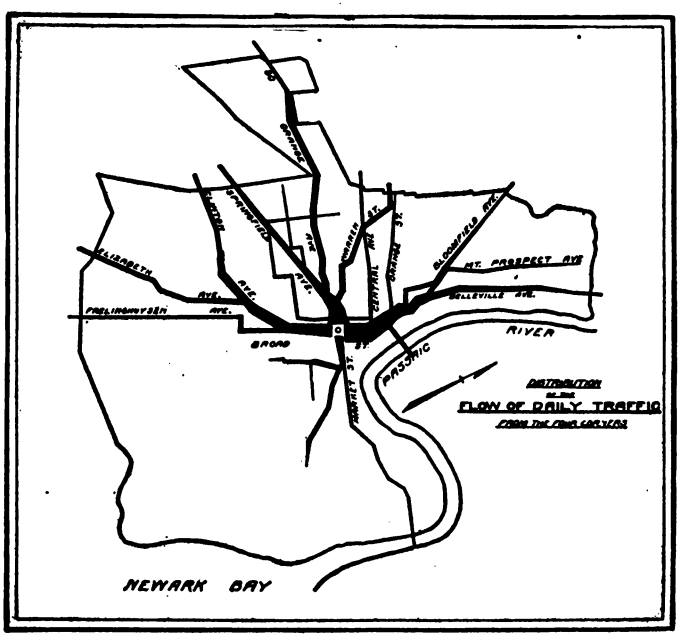
There is no problem in connection with the city plan which deserves more effort and outlay for the collection of fundamental data than that of transit, especially when viewed in the light of the profound effect which quick, comfortable, and cheap facilities have exerted on the growth



Fundamental data on transit touching conditions past and present, showing routes, traffic density, time and fare zones, etc., will be required. Approximately 200,000 people enter and leave the "Four Corners" in the city of Newark upon the trolley cars each day from 7 A.M. to 7 P.M. The greatest proportion of this travel is north and west, as shown by the width of the bands in the diagram. These illustrate the proportion of travel upon each of the various routes.

and prosperity of those cities that have approached the problem in a comprehensive way.

Railways: Passenger Terminals.—A very potent influence

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in the arrangement of the street and transit system, and in the layout of the business and residential districts, is exerted by the location of the railway terminals. Moreover, their design and operation vitally affect the speed and cheapness of traffic handling and, consequently, the number of trains which can be sent out of or received at the terminal at the rush periods. Complete data bearing on all phases of the problem will be essential, therefore, in working out a comprehensive plan for all the railways entering the city.

We should have a map showing the entire terminal area in the city now occupied by railroads, showing those devoted exclusively to passenger traffic, and denoting by different colors the railroad property fully occupied, that which is only partially utilized, and that which is now unused, and, in addition, the property which is controlled by the separate railroad systems. The present assessed value of the various parcels of land under occupancy and the assessed value of private property contiguous to the railroad right of way should be noted.

Detailed plans should be drawn showing the layout of each of the present railroad passenger terminals. These detailed plans will include (a) a plan of the layout of the track system, whether through, loop, or stub, (b) a plan of the throat arrangement, showing methods of switching for both suburban and long distance trains, (c) the location of coach yards and of other auxiliary plants and buildings, (d) the arrangement of waiting rooms, concourses, and platforms, and, as an adjunct to the study, (e) the plan of the surrounding streets and approaches, and of all rapid-transit and surface-car service. In this connection, special traffic counts in the streets and intersections adjacent to the terminal will be taken for a normal day, and, particularly, at the rush hours, separating the automobile, horse-drawn and pedestrian traffic, and as far as possible the

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traffic which originates in the terminal itself, at nearby freight stations, or at other special sources.

Data on the *volume of suburban and through train traffic* for a normal day and for the rush hours should be secured, showing the number of trains both inbound and outbound, the time consumed in the separate movement of each train, the average number of cars and passengers per train, the daily passenger movement of each type, the tonnage and number of pieces of baggage, mail, and express handled, the methods by which the latter is taken on and off trains, and the destination of each class of tonnage, whether for local or through points.

Similarly, statistics should be collected from all available sources showing the yearly passenger business in the city and for the entire country for several years past, showing the passengers carried, the passenger miles, the average revenue per passenger, the operating expenses, and operating revenues, on which an estimate of probable future growth of traffic and revenues may be based.

Railways: Freight Terminals.—Any revision, enlargement, or consolidation of the freight terminal facilities now in existence, aimed at an adjustment or better articulation of such facilities in a comprehensive city plan, must be based on a detailed and far-reaching investigation of the operation, location, and design of all existing railroad properties for handling freight. Such an investigation will require (a) a determination of the present traffic of all roads, both for through and local freight, and in each case for that arriving in carload and in less than carload (l.c.l.) lots, and (b) a study of existing terminal facilities.

A map should be prepared showing the location of the break-up or receiving freight yards of the various roads in the terminal district and in the outlying regions.

Diagrams should be prepared showing the number of inbound cars, daily and the per cent. of these interchanged

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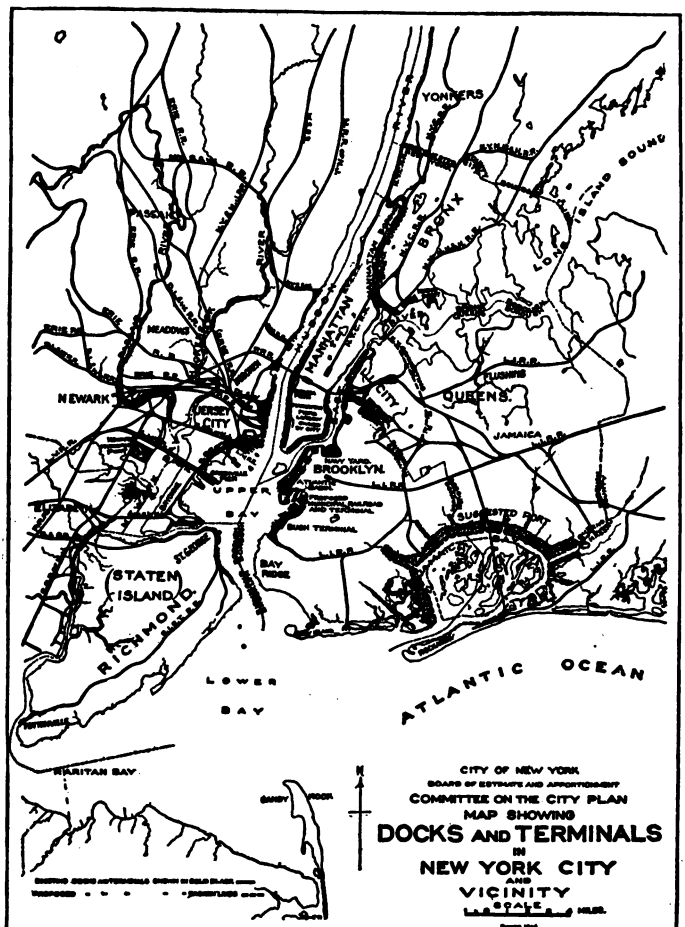

A very potent influence in the arrangement of the street and transit system and in the layout of the industrial and residential districts is exerted by the location of the rail and water terminals for passengers and freight. The above diagram shows at a very small scale the outstanding features as existing in New York. More detailed maps at a large scale will be required for each phase of this difficult and vital problem.

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via belt lines, via direct switching, and delivered locally via freight lines, car floats, team tracks or industry sidings, with which should be shown the movement of outbound traffic.

A diagram should be prepared showing daily total package freight business, i. e., in less than carload lots, indicating the number of tons inbound, with per cent. interchanged via cars and team to connecting roads, and per cent. for local delivery via teams, industrial cars and lighters, and similarly for outgoing tonnage.

The cost and volume of the transfer business through the central district due to distributed terminals ought to be determined for the purpose of evaluating the comparative advantages of possible new arrangements or the consolidation of facilities.

Charts should be prepared, showing the direction and volume of freight movement along established routes on the city map, showing the number of cars per month by broad bands, properly proportioned in width, noting goods for local consumption and for points beyond the city.

Data should be collected and graphically illustrated showing the detention of cars at team and industry sidings held after setting and notification, noting the number for each day over a ten-day period.

Data should be had on the comparative usage of areas devoted to inbound, outbound, and combined houses, by districts, within the business district, showing for all types the ground floor area of the freight house, the total area of house and tracks, the total car standing capacity, and the average tonnage handled per day. Similar data on the comparative usage of team tracks should be compiled.

All of this data will permit of close study of the present efficiency of freight handling by the facilities now provided, looking toward a plan for more intensive uses of these properties, the provision for new yards or terminals, or

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for joint operation in accordance with a comprehensive scheme.

Waterways: Freight and Passenger Terminals.—The data required for a study of waterway improvement will include a statement of the number of vessels of various types entering the port for a series of years past, of their tonnage, of the charges for the use of port facilities, and of the class of business: (1) ocean ship to coasting ship, (2) ocean ship to railway, (3) ocean ship to warehouse, (4) ocean ship to barge canal, etc. Special traffic counts as to the character and extent of traffic, water-borne, railway and vehicular, at points of special concentration will be required.

Plans should be drawn to uniform scale showing the *types of port development* and the nearby water front as existing, showing breakwater, approach channels and depth, basins, docks, piers, dry docks, where any or all of these exist, and the adjacent street system and means of approach. The total water area and lineal quayage of docks and basins should be noted.

The dimensions of *docks,* types of *shed construction,* the supply of *hydraulic, electric, and other power cranes, winches* and *capstans,* at different docks, quays, and warehouses, with capacity and number of each, and the height of lifts, and capacity and distribution of floating cranes, if any, should be noted. All warehouse and storage areas in proximity to the water front, the floor space, types of construction, capacity for various types of merchandise, value of contents at normal periods, and connection with railways should be noted.

All *port charges* at private or public docks will be noted, whether levied on the net tonnage or on the basis of general dock accommodation.

The facts as to the ownership of the entire harbor area, the capital invested by all interests in terminal develop-

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ments, the revenues and expenditures, the dock tonnage, rates on vessels, the dry-dock rates, dock rent, dues on goods, receipts at warehouses, the interest charges, cost of dredging, lighthouses, lightships, and insurance will be noted.

Plans for all docks, piers, and landing stages and approaches devoted to *passenger traffic* will be made, noting the proximity to main-line railways, street-car and rapid-transit lines, and the facilities for handling baggage and for conducting customs examination.

Cost income and data similar to that outlined above will be collected in regard to passenger terminal operations.

Methods of Control

A city plan that is practicable and capable of realization at a time not too remote must be, to a considerable extent, the resultant of studies based on the legal and financial expedients included in the existing administrative powers of the local government. For that reason, a study of methods of control of land and buildings, of powers for the regulation of public utilities, street traffic, and public nuisances, will form an essential part of our fundamental data.

Building Regulation.—A knowledge of the laws affecting the erection and maintenance of buildings in the city and of the best practice in other cities will be essential, as well as a knowledge of the powers conferred on various departments of the local government having control over structural matters, and the channels of appeal from their decisions. The specific requirements in this respect will touch on the laws relating to domestic hygiene in rooming houses and tenements and in special manufacturing and trade buildings, as also the structural requirements for these and other buildings in regard to wall openings and the provision of open spaces, including interior and exterior courts,

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and the limitation of building heights. The laws relating to public and semi-public buildings and resorts—theaters, music halls, churches, etc.—will be included in this review, as well as provisions affecting dangerous and neglected structures, and aimed at securing a reduction in the fire hazard, particularly in tenements, workshops and amusement resorts.

Execution of Public Improvements.—The laws and ordinances affecting the construction and protection of sewers and conduits and the control of drains and sanitary fittings in houses and factories should be studied.

The ordinances and acts relating to the cutting through, widening, extending, closing, and paving of streets and highways should be studied, particularly with reference to the liability of abutting property owners, and the standards of width and arrangement provided for different uses. The legal principles involved in matters pertaining to setbacks, encroachments, and other building frontage lines should be reviewed.

Public Franchises.—An investigation of the franchises under which public service corporations are operating, whether in the matter of water, sewerage, gas, electricity, or transportation, should be undertaken, and all franchise terms should be carefully studied to determine on ways and means by which the city may require improved service, or by what method and at what time the city may, by purchase or otherwise, come into possession of the properties. The study of model franchises, existing and proposed, and of expedients adopted in other communities, will be valuable.

Where the public service is rendered by the municipality an investigation of rates and service rendered and a comparison of these with similar rates and service in other communities should be undertaken.

Traffic Regulation.—All existing local regulations aimed at increasing the speed, volume, and convenience of street

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travel, should be investigated with a view to adapting these to new needs which the survey of the street system has emphasized.

Abatement of Nuisances.—The laws on dangerous and noxious businesses and offensive trades, on the abatement of smoke and noise, and on the removal of refuse and the keeping of animals on premises should be reviewed.

Paying for Improvements

In regard to financial operations, there are several aspects of the problem which should be considered. These relate to (a) private or personal initiative in improvement along city-planning lines, (b) to organized semi-public operations, (c) to private enterprise with public aid, (d) to organized semi-public enterprise with public aid, and (e) to governmental expenditure, whether by federal, state, or local means.

In all of these matters the city planner should be familiar with the fundamental cost factors, such as the cost of the various municipal services both for installation and maintenance, as sewage disposal, water supply, garbage disposal, refuse collection, street cleaning, street paving of various types, and, also, the cost of building construction of various sorts—particularly houses for workingmen and recreational or administrative buildings.

For those improvements which are to be undertaken by the municipality, he will investigate the sources of public revenue, whether through taxation, special assessment for benefits, excess condemnation or otherwise, as well as the present extent and character of the city's indebtedness and the limitations on the borrowing power of the community. Moreover, he will investigate the laws and decisions relating to the municipal ownership and acquisition of land, whether by bequest, condemnation, or purchase.

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Finally, he will make himself familiar with all types of administrative bodies charged with devising and executing

Land values have a strong influence on the character of any proposals which the city planner will make for the improvement of existing conditions. A map showing the prevailing land values, such as that shown herewith, in which the numerals indicate prevailing assessed values per front foot for inside lots, is an important part of the required data.

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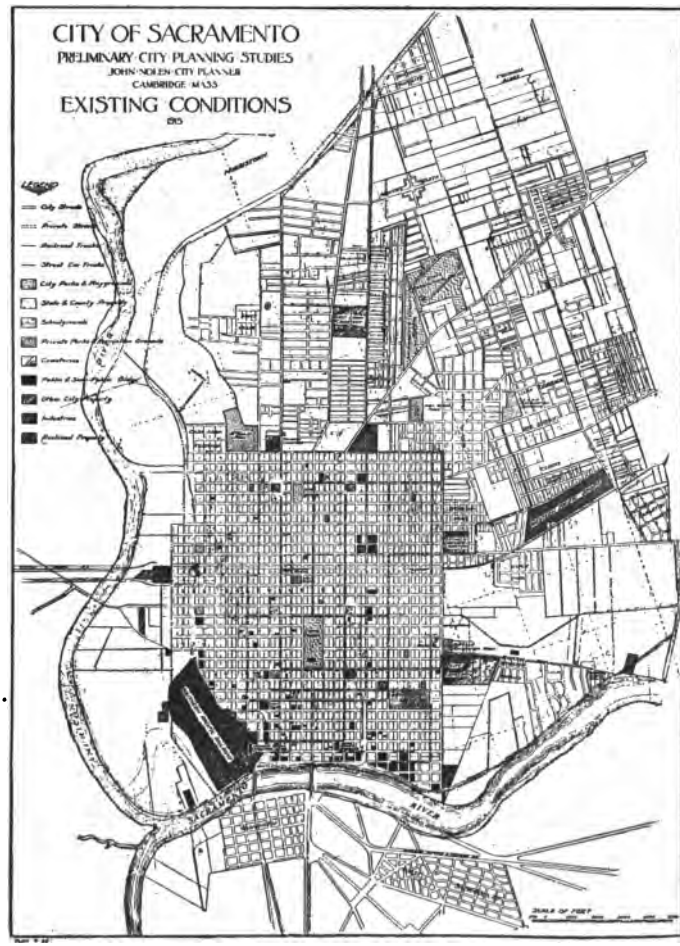

city plans, with the idea of promoting legislation that will give to the local controlling body the fullest powers consistent with the constitutional and chartered limitations of the local government.

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Conclusion

The collection and collation of fundamental data, such as we have briefly outlined in the foregoing chapter, are matters requiring intelligent and persevering efforts, over an extended period of time, by an organization specially charged with work of this character. The total cost will vary, and it will not be small in any instance, but with the widened appreciation of the character and importance of such data in all city-planning work, the acquisition of them will constitute in the future one of the permanent functions of a well-organized city government.

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CHAPTER XVII

CITY FINANCING AND CITY PLANNING

In the literature and discussions on city planning, the phrase "the bills for city planning" occurs so often that there is a prevailing impression that city planning is no more than a bill producer—an expensive luxury for which municipal credit must be strained and new and heavy burdens borne by the taxpayers. This impression may be gained also from the reports of city planners and city-plan commissions. It is the usual thing for a city-plan report to conclude with several recommendations for improvements which demand a great outlay of money. It is not unusual for the city-plan commission, after the first few months of its history, to report that its task is almost hopeless because of the great difficulty in financing even the needed improvements. These discouraging conditions are due to different causes in different communities. but there are some causes which probably exist in every American city. If a city is alive, it is bound in twenty-five years of normal, healthy development to have greater community needs. A city of 500,000 becomes crowded in a street plan adequate for a city of 200,000. A city of 100,000 needs parks and playgrounds which might be thought luxuries in a city of 25,000, and if the quarter-century's growth has been without regulation and in accordance with no plan, the community's bill must be greatly increased by the heavy expense for correction of errors. This is a usual condition in American cities, but it is not a bill for city planning.

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It is a bill for surgical services, and the size of the bill cannot affect the need of the operation.

These usual financial difficulties may be aggravated by limitations on the borrowing power of the city or by archaic methods of raising money or distributing the expense of a physical improvement. In other words, with the physical growth of the city there has not been a corresponding development of a financial plan to meet larger needs. The duty, then, of the city planner is, not only to show the soundness of his suggestions for the physical improvement of a city, but to present a plan for financing them. If the municipalities are convinced that the suggested improvements are necessary and that they will be receiving full value for money spent on them, obstacles to their financing which are caused by archaic limitations on borrowing ability or obsolete methods should be relegated to the junk heap.

The wisdom of proposed improvements depends entirely on local conditions with which we are not concerned in this chapter. We shall assume that the prophetic function has been fulfilled for a healthy city of from 100,000 to 150,000 inhabitants; the rate and direction of the city's growth for the next fifty years—about as far ahead as it is safe even for a planner to look into the future—have been estimated; the main arteries of the newer city have been plotted; the areas for industrial and residential occupation have been indicated, and the sites for parks, playgrounds and other public open spaces have all been determined, and the suggestion made that a generous area in suitable locations be acquired for a "reserve account" to be drawn on as future needs arise; the transit problem has been studied and recommendations made. The determination of these and the planning of the city in accordance with this determination will go far to establish the plan as the path of least resistance in the city's future development.

As this chapter is not concerned with the wisdom of im-

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provements, neither is it primarily concerned with the financial policy of the city as between borrowing by bond issues and the pay-as-you-go plan. A judicious combination of the two plans is still pretty generally agreed to be the most practical policy. Certainly to pay for a costly permanent improvement, such as a modern water-supply system, out of taxation would result in a tremendously burdensome tax rate, unfair to the present taxpayer and disastrous to the development of the town. The important thing is that the city or town should have a financial policy or plan, and the real business of the planner is to show that a plan for physical growth is as essential as a financial plan—that the two are so mutually dependent as to make it unimportant to consider which is more essential.

The truth of this seems to need but little illustration. One of the heaviest expenditures in rapidly growing cities is for street widening and extension, made necessary by errors in planning, many of which could have been avoided by ordinary foresight. In 1914 the city of Boston spent $1,300,000 to make a new street in the heart of the congested business district. Before this street was cut through there was no cross street from Boylston to West Street, a distance of about a thousand feet, in one of the busiest retail districts in the city. The necessity of such a street certainly could have been foreseen thirty or forty years ago and the operation effected without such a large outlay. The widening and extending of Seventh Avenue in New York City in 1913, at an estimated cost of $4,344,000, is another notable instance. The acquisition of sites for public buildings is also an unnecessarily heavy burden resulting from the common practice of cities to purchase their sites at top figures or get them through the very expensive condemnation method.

With a plan, a reasonably accurate forecast of land needed for a quarter of a century ahead could be made. If the

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present price of such land, plus the carrying charges for a period of from ten to thirty years, showed a saving over the probable purchase price at the time when the city actually needed the land, it would be good business to buy the land now. With the help of a committee of real-estate appraisers, whose business success depends on their ability to gauge future values, this determination could be made with a fair measure of exactness, and the occasional losses on account of miscalculation would be offset by the great gain to the city in being able to select the most desirable sites at reasonable prices. In this connection, an interesting table was prepared by Mayor Gaynor's committee on congestion of population in 1912. The committee examined the value of 943 city sites which had been acquired at different times from 1812 to 1908 and found that the assessed valuations in 537 cases increased at least 25 per cent. over the price paid. Of the 406 parcels which showed little or no increase over the purchase price, 230 had been acquired since 1900, and had been held by the city only from three

Per Cent. of Increase in Value of Site	Sites Which Increased in Value as Specified
Less than 25 per cent	91
25 and less than 101 per cent	154
101 and less than 201 per cent	94
201 and less than 301 per cent	42
301 and less than 401 per cent	43
401 and less than 501 per cent	17
501 and less than 601 per cent	18
601 and less than 701 per cent	10
701 and less than 801 per cent	12
801 and less than 901 per cent	10
901 and less than 1,001 per cent	6
1,001 and less than 1,501 per cent	11
1,501 and less than 2,001 per cent	10
2,001 or more	19
Total	537

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to ten years. The table would, of course, have been of much more value if the time of acquisition had been in some way indicated, but it is certain that only very few sites had been in the city's possession more than fifty years.

But it is not enough for the planner to show the general financial advantage resulting from a city plan. He is told that all the revenue from taxation must be appropriated for immediate needs, for the upkeep of the present city plant, and the payment of interest on present indebtedness; that the tax rate cannot be increased, that the city is up to the limit of its borrowing ability, and that there are consequently no available funds for new work. He must show the appropriating bodies, specifically, not only how to get more for available money, but how to make more money available for carrying out the recommendations in the city plan.

Increasing the City's Borrowing Ability

The limit of a city's borrowing ability, that is the amount of *net* indebtedness which cannot be exceeded, is generally fixed either in the state constitution or city charter as a certain per cent. of a city's assessed valuation.[1] This percentage varies greatly, as appears from the following data:

Seattle and Other Cities of Washington: 1½ per cent. and an increase of 5 per cent., with the assent of three-fifths of the voters, for water, light, and sewers, when such public utilities are owned and controlled by the cities.

Detroit: 2 per cent., exclusive of water bonds.

Boston and Other Massachusetts Cities: 2½ per cent., and *Massachusetts towns:* 3 per cent., both exclusive of debts for water, lighting, and payment of grade-crossing damages. Bonds for lighting alone may be issued not exceeding 5 per

[1] Assessed valuation may vary from full market value down to 50 per cent. of such value.

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cent. of assessed valuation in a town; 2½ per cent. in a city.

Denver: 3 per cent., exclusive of bonds for water, lighting, and other public utilities, works, or ways from which the city derives a revenue.

Cities of Ohio: 4 per cent., exclusive of bonds for (1) water works, when the income from the said works covers the cost of operating, interest, and sinking fund, and (2) bonds to be paid for by special assessment on property specially benefited by an improvement. A two-thirds vote is necessary for the issue of all bonds which make the net indebtedness exceed 4 per cent.

Cities of Illinois: 5 per cent.

Cities of Wisconsin: 5 per cent.

Cities of Minnesota: 5 per cent., exclusive of bonds (1) for construction of public drainage ditches; (2) for acquiring land for streets, parks, and other public improvements, when such are payable from the proceeds of special assessment; (3) for water works, public lighting, heating, and power plants; (4) for acquisition of street railways, telephone or telegraph lines, or any public convenience from which revenue is or may be derived.

Pennsylvania: 7 per cent.

New York: 10 per cent., exclusive of water bonds.

Nebraska: 10 per cent., and an increase of 5 per cent. with the assent of two-thirds of the voters.

If 10 per cent. is a safe limit in New York, 2 per cent. is unduly conservative. Certainly where the limit of bonded indebtedness is under 5 per cent. of the assessed valuation and the comforts of municipal life are denied to the citizens, the limit should be raised.

To determine what should be fixed as the proper limit of municipal indebtedness, it is worth while considering that, since interest charges for bonds must be raised by taxation, a limit on bonded indebtedness has a very practical relation to the tax rate. We may assume that a tax rate should not exceed twenty dollars a thousand, and that

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the town will require at least three-quarters of the revenue raised by taxation for its ordinary operating expenses. This would leave about five dollars in every thousand for interest on bonded indebtedness, and it has been estimated that at the current rates for municipal loans this would result in fixing the limit on borrowing ability at about ten per cent. of the assessed valuation.

The second suggestion for stretching the borrowing ability of cities is indicated in the data given above. It has become the general practice in defining what is meant by net indebtedness or borrowing ability to exclude the bond issues which are made for self-supporting utilities. Those generally excluded are bonds for water and lighting. It is as logical and financially sound to exclude so-called local improvement bonds where the revenue for the payment of bonds comes from the assessment levied on private property for the special benefit resulting from the improvement. From this idea comes also the suggestion that certain bonds should not be a general liability of the city. Thus water-front improvement bonds should be secured only by water-front property and activities. This limitation of liability is found in the Minnesota and Wisconsin practice of purchasing land under a contract calling for installment payments.[1] It is specifically provided in both the Minnesota and Wisconsin law that the contract shall not create a corporate liability or constitute a pledge of the general credit of the city, and in construing this provision the supreme courts of both states have declared that there is no obligation on the part of the city to meet unpaid installments, since the city has merely an option to purchase, with the right of possession until default in payment.[2]

[1] Acts of Wis., 1891, ch. 179, s. 8; Sp. Laws of Minn., 1889, ch. 30, s. 2.

[2] *Burnham* v. *Milwaukee*, 98 Wis. 128; *Kelley* v. *Minneapolis*, 63 Minn. 125.

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Special Assessments

The levying of an assessment on property which has received a special benefit because of an improvement is the American device which is particularly attractive to the planning financier; first, because it seems to be based on the equitable principle of putting the burden on the properties that are directly benefited, and, second, because it relieves the burden of general taxation. There are many striking examples of the increase of value of private property through the expenditure of the community's money in street widening and in the establishment of parks and parkways. Of those most often cited is the Kansas City Park development, where old and unsanitary properties were wiped out and a value was given to the land entirely out of proportion to the municipality's outlay. The laying out of Prospect Park in Brooklyn increased the value of neighboring land 400 per cent. over a fixed period as against 100 per cent. in other parts of the city, and the increase resulting from Central Park in New York City over the same period is estimated at 800 per cent. as against 100 per cent. for the rest of the city.[1]

The justice of the special assessment method appealed so thoroughly to Mr. Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment, New York City, when presenting the subject "Paying the Bills for City Planning," at the Boston meeting of the National Conference on City Planning, in 1912, that he submitted the following conclusions, which were adopted by the Conference:

Whereas, It is the sense of the Conference that, however admirable may be the plans prepared for the improvement of cities, progress must depend in large degree upon the equitable

[1] This increase in assessed valuation should be included in the financial result of city planning.

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distribution of the expense involved in the execution of the plans and in the soundness of the methods employed in financing them.

Resolved, That the Conference hereby approves of the five general principles laid down in the paper presented to the Conference upon this subject by Nelson P. Lewis and commends them to the cities here represented, namely—

1. Where there is local benefit, there should always be local assessment on the land benefited.

2. The entire city, or the metropolitan district, should bear no part of the expense unless the improvement is in some degree of metropolitan importance and benefit.

3. Assessments should not be confined to the cost of acquiring and improving streets, but should extend to any improvement which will increase the value of the neighboring property, and should be apportioned as nearly as possible according to the probable benefit.

4. A workable policy once adopted should be consistently adhered to.

5. The determination of a policy and its application to each case should be intrusted to a board composed of men especially qualified, whose terms of office should so overlap as to insure continuity of policy and purpose.

These principles are found in the Laws of New York, Chapter 679, Acts of 1911, Section 247:

Before a public improvement of any kind (except an improvement to be made pursuant to the rapid-transit act) involving the acquisition or the physical improvement of property for streets, public places, parks, bridges, approaches to bridges, for the disposal and treatment of sewage or the improvement of the waterfront, or involving both such acquisition and physical improvement of property, which acquisition or physical improvement, or both, is estimated to cost the sum of fifty thousand dollars or more, shall be authorized, the board of estimate and apportionment may determine in what manner and in what shares and proportions the cost and ex-

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pense of the acquisition or physical improvement, or both, shall be paid by the city of New York, by one or more boroughs thereof, by a part or portion of one or more boroughs thereof, or by the respective owners, lessees, parties, and persons respectively entitled unto or interested in the lands, tenements, hereditaments, and premises not required for the said improvement, which said board shall deem peculiarly benefited thereby.

There are sixteen instances of the use of the act;[1] the most notable of which is in the widening and extending of Seventh Avenue, where the estimated cost of $4,344,000 was assessed as follows:

On neighboring property found specially benefited	$1,954,800
On the Borough of Manhattan	1,737,600
On the Borough of Brooklyn	477,800
On the Borough of the Bronx	173,800

and in the acquiring of East River Park, where the estimated cost of $1,300,000 was assessed as follows:

On property specially benefited	$130,000
On the Borough of Manhattan	455,000
On the Borough of Brooklyn	292,500
On the Borough of Queens	422,500

Assessing private property for the benefit resulting from the construction of a rapid-transit line has been seriously considered, and may in rare instances in the United States have been attempted. It is as logical and just as any other form of special assessment, but is hardly more than a field for the exploration of the financial planner. Special assessments probably never will attain the result of perfectly dis-

[1] *See* Report of the Chief Engineer of the Board of Estimate and Apportionment, New York City (1913), p. 40.

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tributing the cost of an improvement, but they should inevitably relieve the pressure from taxation or from bond issue. The community gets an immediate return from its outlay and more money is made available for municipal needs.

Excess Condemnation

The same results are claimed for the method of financing improvements practised in some European countries, and known in the United States as excess condemnation. By constitutional amendment in Massachusetts, New York, and Wisconsin, municipalities may acquire by purchase or condemnation more land than is actually needed for the construction of an improvement, with the right of resale after the completion of the improvement. Property thus taken is declared to be taken for a public use. In special assessments the return to the community comes from a species of tax on private property, but in excess condemnation the return comes through the sale of the excess land at an increased price resulting from the improvement. Its value as a financial expedient has hardly been tested in America, and the principle of the amendment is so contrary to the spirit of individual rights that rapid headway cannot be expected in view of the litigation which will follow its use. There is also a chance of loss. The city is really somewhat of a land speculator. Values may not rise as soon as, or as much as estimated, and increase in value may be offset by carrying charges.

The value of excess condemnation as a financial expedient cannot conclusively be shown by the figures which are available from European countries. It appears from a parliamentary inquiry on the subject in England [1] that the consensus of those best informed was against its use for purposes of recoupment alone. Experience with the principle

[1] *See* Mass. House Document, No. 288, of 1904, p. 67 ff.

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in Brussels was so costly that the city barely escaped bankruptcy.[1] The only instances of the financial success of the principle in America known to the writer are in Montreal, where the following data taken from official sources show a sale of excess land at a profit to the community:

St. Lawrence Boulevard Opening	
Amount of land taken	102,002 sq. ft.
Land used for street purposes	48,910 sq. ft.
Land sold	53,092 sq. ft.
Total purchase price	$690,570.00
Net returns from sales	716,194.00
Profit	$25,624.00
Cartier Street Opening	
Land purchased	130,817 sq. ft.
Land used as street	55,637 sq. ft.
Land sold	75,180 sq. ft.
Total purchase price	$99,626.00
Net proceeds of sale	112,443.00
Profit	$12,817.00
George Etienne Cartier Square	
Land purchased	164,504 sq. ft.
Land used as streets, lands and square	82,426 sq. ft.
Land sold	82,078 sq. ft.
Total purchase price	$82,252.00
Net proceeds of sales	99,032.00
Profit	$16,780.00

Issuance of City Bonds

Special assessment and excess condemnation are calculated to relieve the burden on the general revenue by a fairer distribution of the cost of the improvement over

[1] Mass. House Document No. 1096, of 1904, p. 14.

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the area benefited. There remains, to speak of, a fairer method of distributing the cost over a period of years. This is well brought out in the following extracts from a paper presented at the Conference on City Planning by Andrew Wright Crawford, of the Philadelphia bar:

The efficient life of the thing constructed by the proceeds of municipal bonds should measure their term, that efficiency being measured by adequacy of service to the community, and city planning is indispensable to determine that length of efficient life of a municipally constructed thing. Hence the issuance of city bonds calls for city planning as a prerequisite.

How shall we equitably provide payment for things needed now in a measure which will hereafter be needed in the same or a greater or conceivably a smaller measure? This question of financing will find an answer to some degree in a differentiation among the things constructed by the proceeds of municipal bonds.

In the case of outlying parks, we who secure them should pay the minimum. Fifty years hence these parks, now suburban, and now somewhat of a joyous luxury, will be indispensable to their urban neighborhoods. We should be able to issue bonds for such parks with a very small sinking-fund charge today, graded up to a large charge fifty years hence—more: we should make park bonds run seventy-five or one hundred years and make their present amortization charges negligible.

The term of paving bonds should be in the neighborhood of fifteen years, and the immediate amortization charge should be very heavy—the charge fourteen or fifteen years hence very light. We who have the pavement at its finest should pay the highest toll.

Stone and concrete bridges are expected to last for seventy-five years. Bonds issued to provide the money for them should run as long. It is more difficult to determine whether their

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amortization charges should be graded up or down, or kept at one figure throughout. In the case of centrally located bridges, perhaps the last course would be advisable. In the case of bridges in suburban territories, their future greater usefulness justifies a heavier future sinking-fund charge.

The system of main sewers may deserve a diminishing amortization charge—of main streets, an increasing one. Public buildings probably deserve a diminishing charge throughout, though possibly the summit of their serviceableness is neither at the end nor at the beginning of the life of the bonds issued for them, but at some period during that life—probably nearer its beginning than its end. The deterioration of the physical building must be considered, and deterioration begins at once.

On the other hand, bonds issued to provide funds for the acquisition of the real estate upon which public buildings are to be erected clearly deserve an increasing amortization charge throughout. The division for taxation purposes of land, from improvements thereon, will show how markedly the former often increases in value while the latter decrease.

Each other city improvement should be considered likewise.

It is true that some of these suggestions would require changes in state constitutional provisions before they could be carried out. But if city planning should contemplate a minimum of fifty years for physical results, a minimum argued for hereafter, a delay of four or five years in order to secure constitutional changes is not of paramount importance. Constitutional provisions and acts of legislatures will change during fifty years anyway; there will be much gain if they are planned to meet city-planning requirements *pari passu*.

Financial Results of City Planning

The various devices for getting more for the community's outlay, and for making the community's money go farther, presuppose a plan. The plan will separate the industrial area from the residential area and increase the desirability of both for their separate purposes and thus increase munic-

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ipal revenue. A plan for the extension of thoroughfares and rapid-transit lines will stabilize real-estate values and make special assessment for benefit fairer to the property holder and more remunerative to the community.[1] But, after all, these are the indirect results of city planning. Its chief financial value is in the prevention of errors of physical development and the consequent waste of community money. If we take the bill of the typical American city of over 200,000 population for street widening and extension and establish thirty per cent. of it as the amount which should have been saved, we get an idea of the value of the chief product of city planning and conclude that, rightly understood, city planning is the first requisite in wise city financing.

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[1] See footnote on page 349 for another financial result of city planning.

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CHAPTER XVIII

CITY-PLANNING LEGISLATION

The city-planning movement in the United States and Canada has begun but lately to entrench itself in legislation. Having, however, secured a foothold on the statute books, its advance is now likely to be more assured. Meantime, the beginnings are, as in every such enterprise, particularly interesting. They have also the significance of marking a third stage in the progress of the American city-planning movement.

There was, first of all, the usual propaganda, this lasting several years. Then came an enunciation of general principles—diverse arguments unfolding gradually into the syllogisms of a developing science; and now, as the third step, there begins to appear the embodiment of principles in laws, the setting up of the legislative machinery to transform theory into action. Clearly, this is immensely important. To those who believe in city planning it is big in promise for the future.

City-planning legislation may be divided into groups of enactments having different purposes. Sometimes these enactments are to be found in the different sections of a single law; more often they are separated. There is the general (permissive or mandatory) legislation, designed to provide the city or town with a planning commission; there is the legislation which gives to such a commission authority beyond the town or city boundaries—to the end that its planning may really look into the future—and that permits

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different legislation for the different parts of a community; and finally there is the legislation which is designed to expedite or facilitate the financing of planning projects. Such authorizations are still novel in American municipal procedure. It only remains to add, in introduction, that laws and ordinances which the courts are known to have declared unconstitutional have been omitted from the following summary.

Establishment of City-Planning Commissions

Since American cities and towns enjoy so little "home rule," legislation of the first type, to provide for official planning commissions, has been mainly by states and provinces. Four characteristics may be noted in regard to it:

1. With a marked unanimity the laws ask planning commissioners to serve, as park commissioners so commonly do, without remuneration. The theory of such requirement has been aptly expressed in these words: "The kind of control which shall be really statesmanlike and of the highest value must be either paid for at a very high figure, or be obtained for nothing; and probably the latter method is the best."

2. There is very frequently a requirement that the existing administrative bureaus of a city shall have *ex officio* representation on the planning commission. Sometimes this applies also to the legislative agencies. Such provision tends to prevent an obstruction due to jealousy, takes care of overlapping, and makes available what is sometimes really expert knowledge.

3. There is some tendency to give to planning commissions, as originally to art commissions, powers that are only advisory.

4. When larger powers are given, commissioners usually

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are granted authority, by implication if not explicitly, to retain experts.

In the following citations of acts for the creation of planning commissions, the states and provinces are named in alphabetical order for convenience of reference.

The Province of Alberta, Canada, adopted a town-planning act in 1913 (Chapter 18, Acts of 1913). This provides for an appointed commission of five to ten members, and otherwise follows in a general way the principles of the well-known English enactment.

California, on December 10, 1912, amended the charter of San Francisco to provide for establishing a city-planning commission—which an ordinance of April 6, 1914, created. The commission consists of nine members, of whom three are the city engineer, the city architect, and the city attorney —*ex officio*. The other six are appointed by the mayor, and all serve without pay. Alameda, Berkeley and Oakland also have now secured commissions.[1]

The Dominion of Canada as a whole added, in 1914, a town-planning branch to its Commission of Conservation.

Connecticut claims the honor of having established in 1907 (Joint House Resolution 201) the first plan commission, officially so designated, in the United States. This was for Hartford, the capital city. It includes, as *ex officio* members, the mayor, the president of the board of street commissioners, the president of the park board, and the city engineer. It also includes two citizens who do not hold other municipal office, and one member each from the board of aldermen and the common council. The members are not paid. In 1913 Connecticut supplemented this legislation by three special acts, applying respectively to New Haven (House Act 243), to New London (Special Act 351), and

[1] In 1915 California passed an act (Senate bill No. 610) authorizing the creation of a city-planning commission in any city or town of the state.

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to West Hartford (Special Act 291). For New Haven, a city-planning commission was created with power to make a comprehensive plan for the city, and for that purpose to employ experts, as Hartford had done. In New London, this authority was given to the park board, presumably because that board, having retained a well-known city planner to map out a park system, was convinced by him of the desirability of treating the park plan as only one aspect of a city plan. West Hartford was given permission to create a plan commission if the people voted in favor of it.

Maryland, in 1910, enacted a law (Chapter 114) providing for a city-planning commission in Baltimore, to consist of the mayor and of eight persons appointed by him, to have a paid secretary but themselves to serve uncompensated. The commission was required "to investigate all plans proposed for the construction or extension of public highways in the city of Baltimore, and the establishment of a civic center or other public improvements in connection therewith." But Maryland can contest with Connecticut the honor of having initiated the earliest general city-planning legislation in the United States, for in the sudden emergency created by the Baltimore fire of 1904, the legislature enacted a law (approved March 11, 1904) creating for Baltimore a Burnt District Commission, charged with the task of replanning the burned-over section. This commission was given power (Sec. 2) to open, extend, widen, straighten or close streets and alleys, to establish squares, to determine building lines and sidewalk widths, to extend or partially fill the harbor, etc. In other words, as a temporary expedient and over a limited area, there was early created a commission with real town-planning powers.

Massachusetts, in 1913, took much more sweeping action than had Connecticut or Maryland. It passed legislation (Chapter 494, Laws of 1913) *requiring* all its cities and towns that had more than 10,000 population to create local

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planning boards, which, after studying the resources, possibilities and needs of the respective cities, should make plans that would look *especially to "the proper housing" of the people.* This legislation is of interest because, for the first time in such an act in this country, what may be called the human emphasis was expressly enjoined in the words of the act. In cities it is required, under the Massachusetts enactment, that the commission shall be appointed by the mayor, subject to confirmation by the council; in towns its members are elected by the voters at the annual town meeting. The planning board is ordered to submit an annual report, and the cities and towns are authorized to make suitable ordinances, by-laws, and appropriations for the carrying out of the act. In November, 1914, thirty-six such commissions were in existence in Massachusetts, which in this respect led all the states. This progress was largely due to the fact that the act had made the Massachusetts Homestead Commission responsible for reminding the cities and towns of their duty and for assisting them to perform it. It should be added that, prior to the enactment of this Massachusetts law, two cities—Salem and Fitchburg—had already created planning commissions. Salem's had been in existence about a year, while Fitchburg had secured its "Municipal Development Commission" by a special act (Chapter 327, Laws of 1913) which barely preceded the general law. A subsequent act (Chapter 283) of 1914, gives *permission* to towns with a population of less than 10,000 to establish planning boards.

The Province of New Brunswick, in 1912, passed a town-planning act which, approximating English procedure, reads in part (Sec. 1, paragraph 3): "Any local authority may make application to the government for authority to put into effect a town-planning scheme."

New Jersey, in 1911 (Chapter 71, Laws of 1911), gave to any city of the first class authority to appoint a city plan

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commission, "consisting of not more than nine citizens of such city to prepare a plan for the systematic and future development of the city." The commission is further authorized to employ experts, if it so desires; but it must not exceed an expenditure in any one year of $10,000, for all purposes; and the commissioners themselves must serve without pay. Appropriation is to be from the funds of the city. Later, New Jersey raised the limit of annual expenditure to $25,000, and extended to cities of the second class the authority to appoint plan commissions.[1]

New York, under Chapter 699, Laws of 1913, has authorized the trustees of villages, the common councils of cities other than New York City, and the board of estimate and apportionment in New York City, to create planning commissions. These also may employ experts.

Nova Scotia enacted a town-planning law at the same time as New Brunswick, and one of similar character.[2]

[1] On April 6, 1915, the Governor signed a bill (Assembly, No. 591) applying to all "third class cities, fourth class cities, boroughs, towns, townships, and incorporated villages" of the state, authorizing the appointment of a "Municipal Plan and Art Commission" to consist of six members, appointed by the mayor or other executive, "with the advice and consent of the council or other similar governing body as the case may be;" and serving without pay. To this commission are to be referred "all questions concerning the location or acceptance of any public place, playground, parkway, street, avenue, highway, common, boulevard, square, park, or of the design, acceptance or location of any bridge, viaduct, street or park fixtures or structures, or any public building . . . or works of art, proposed to be erected either wholly or partly by public or private funds, for the benefit of the public in such municipality."

[2] This law was superseded in 1915 by one which is much more advanced. The latter makes it compulsory for every city and town of the province to appoint a planning board which, within three years from the passage of the act, must prepare a set of town planning by-laws, unless it chooses to adopt a set of "model by-laws," prepared by the commissioner of public works of the province.

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The State of Ohio, amending its constitution in 1912, gave to its cities authority to manage their own affairs to such extent that it became possible for them to include in their charters provision for a plan commission as one of the administrative agencies. Cleveland and Dayton have availed themselves of the opportunity, Cleveland by a mandatory clause and Dayton by a permissive one. The Cleveland charter provision (Sec. 77), adopted in 1913, reads: "There shall be a city-plan commission to be appointed by the mayor, with power to control, in the manner provided by ordinance, the design and location of public buildings, harbors, bridges, viaducts, street fixtures and other structures and appurtenances; the removal, relocation and alteration of any such works belonging to the city; the location, extension and platting of streets, parks and other public places, and of new areas; and the preparation of plans for the future physical development and improvement of the city." This Cleveland commission consists of seven members, appointed for five years, who serve without pay other than their expenses. The commission exercises the functions of a municipal art commission as well as those of a city-planning commission.

The Province of Ontario adopted, in 1912, a "City and Suburbs Plans Act." This places upon the Ontario Railway and Municipal Board the responsibility of passing upon the plans of those cities of the province having a population of 50,000 or more.

Pennsylvania, on June 10, 1911, passed an act (Penn. Laws, p. 872) creating a department of city planning for second class cities (Pittsburgh and Scranton). It consists of nine persons, *who may or may not* be residents of the city, who are to be appointed by the mayor, and who are to serve without pay. This legislation was supplemented, in 1913, by an act (No. 406) *requiring* each city of the third class—of which Pennsylvania then had twenty-three—also

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to create departments of city planning, to consist of five members to be appointed by the mayor and council and to serve without pay. It was provided, however, that in certain instances the powers of such a department might be delegated to the park board. The following provisions in the above Pennsylvania act to establish municipal departments of city planning are interesting: The members of the commission are to receive copies of all city ordinances and amendments, in so far as these relate to the extension or alteration of highways, or to work upon them, or to the location of public buildings, bridges, tunnels, subways or railroads. The commission may then communicate in writing to the council its disapproval of such ordinances or amendments. Yet disapproval does not operate as a veto. The commission's definite approval, however, is required for plans for all mains to be laid in the city; and deeds of park and playground property cannot be recorded for the city without indorsement thereon by the commission.

In addition to these general laws, several important cities have established plan commissions by ordinance. These cities include: Chicago, in 1909; Detroit, in 1910; St. Louis and Lincoln, Neb., in 1911; Bridgeport, Conn., and Providence, R. I., in 1913; St. Paul, in 1914. But even apart from the local ordinances, it is impossible to run over the long list of recent general enactments without perception of their significance. The laws of four provinces and of eight populous states have opened the way for a wiser planning of very many cities. Nor, in the absence of an organized campaign or of party or "boss" backing, could such laws have been enacted had there not been a body of public opinion to support them, a well-defined wish to take advantage of the permission which they give, and a widespread acquiescence, at least, in the reasonableness of their proposals. This means that within a few months, comparatively, without flourish or display, city planning has been

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coming triumphantly into its own as respects general legislation for setting up of machinery to promote it.

Powers of City-Planning Commissions

In regard to enactments designed to add to the efficiency of the city-planning operation, a field was entered in which opposition was more likely to assert itself. Existing rights and privileges, stirred up by proposals of curtailment, would not be slow to take alarm and to fight. Yet even here the conquest has proceeded with a seeming ease that can be explained only by the public perception of a community advantage coupled with a reasonable consideration for the individual.

From the city planner's point of view, it is clearly of immense importance that the arbitrarily established and invisible line of the city boundaries shall not limit his activities and cut off his schemes. Often a city is built up, in parts at least, not merely to, but well beyond, that shifting line, which, though here today, may be a mile farther out tomorrow. If the city plan has any value, it is in its anticipation of and preparation for the city's future growth; and to hold it within that line would be something worse than to cut the coat of a growing boy from a measure already snug and cramping. Yet beyond that line, the property owner, paying no city taxes and receiving no city service, has heretofore snapped his fingers at municipal enactments. But it is the approach of the city which raises the value of his land, and it is the belief that the city will ultimately engulf him which makes his land so salable. So the lawmakers have listened to the plea of the city planners, and various states and provinces in their sovereign capacity have bestowed upon cities control beyond city boundaries. This is accomplished in the following ways,

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the development of the idea that has come with the lapse of time being, if we except a comparatively early law of Missouri, especially interesting. That Missouri law (Revised Statutes, 1909, Sec. 8541) allows cities of the first class to acquire land beyond their limits for certain designated purposes—as parks, water works, etc., *"or for any other purpose."* It does not appear ever to have been made use of for the control of subdivision platting, and we may doubt whether that purpose was included among the objects of the bill.

Wisconsin, then, in 1909 adopted a law extending the authority of city councils over the platting of lands lying beyond the city limits, but within one and one-half miles of them. Michigan adopted a law which gave to its cities control for two miles beyond their limits. Ohio, in 1910, extended jurisdiction for three miles beyond the city limits, and it may be interesting to quote, as follows, from that act (House Bill No. 147, amending Section 4346 of the General Code relating to Platting Commissioner):

> The Director of Public Service shall also be the platting commissioner of the city. . . . When any person plats any lands within three miles of the corporate limits of a city, the platting commissioner shall, if they are in accordance with the rules as prescribed by him, endorse his written approval thereon, and no plat of such land shall be entitled to record in the recorder's office in the county in which such city is located without such written approval so endorsed thereon; provided, that the approval of the platting commissioner of a city shall not be required unless such city is the nearest to the lands sought to be allotted.

Pennsylvania, following, in 1911, with its "Act Creating a Department of City Planning for Cities of the Second Class," included in the act the provision that the department "may make, or cause to be made . . . a map, or maps, of

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the city, or any portion or portions thereof, including territory extending three miles beyond the city limits, showing the streets and highways and other natural or artificial features, and also locations proposed by it for any new public buildings, civic center, street, parkway, boulevard, park, playground, or any other public ground or public improvement; or any widening, extension, or relocation of the same." The Pennsylvania act of 1913, which has been also referred to above, in which the cities of the third class were required to establish a department of city planning, gave to them, too, the right to map lands lying within a five-mile radius, and provided that no streets within three miles might be accepted or recorded unless approved by the commission. Three miles is the limit now recognized also in the charter of Minneapolis (Chapter VIII, Section 22):

The City Council shall have power to designate by ordinance or resolution such portions of the territory lying adjacent to or outside of the boundary lines of the city as it may deem proper as a City District, and may from time to time extend the limits of such district to include any territory not lying at a greater distance than three miles at any point in direct line from the boundary line of said city, and within said district the City Council shall have control of the laying out of streets and alleys, and the acceptance of plats of additions and the dedication of property for streets and public grounds therein, and may require that all streets and alleys laid out or dedicated within such district shall conform to and be continuous with the system of streets and alleys within said city, and to that end may indicate by survey and plat such streets, alleys, and the arrangement and dimensions thereof, as in its discretion will be best calculated to meet the wants and conveniences of said city and its surroundings or any future extension thereof.

Meanwhile, there had begun to grow up a realization that even a three-mile extension established an arbitrary

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line, while the rapidly increasing use of automobiles and interurban trolleys was bringing into market for home development property that lay even further beyond city boundaries. The town-planning acts of the provinces of Ontario and Saskatchewan, of New Brunswick and Nova Scotia, and of the states of New York and California—all dating later than 1911—recognize this need of a more elastic and indefinite jurisdiction. The City and Suburbs Plans Act of 1912, by the Province of Ontario, which related to cities of not less than 50,000 population, required that plans for subdividing land "within five miles of" such cities should be submitted to the Ontario Railway and Municipal Board, to which it gave the power to demand changes. The enactment of Saskatchewan, entitled a "Regulation Respecting the Subdivision of Land," dated 1913, declares (Section 11) that "when any plan of subdivision is *in proximity to* any corporate city or town, the director of surveys may require the owner to secure the approval of the council of such city or town, or of some one deputed by them, to give such approval." The similar town-planning acts of New Brunswick and Nova Scotia (1912) permit the government to "authorize a local authority to prepare and put into effect a town-planning scheme with reference to any land within, *or in the neighborhood of,* the area over which it has municipal control." The Alberta act, specifically stating that land "in the neighborhood" shall be such as "is in course of development or as appears likely to be used for building purposes," defines the latter clause as including "any land likely to be used as, or for the purpose of providing open spaces, roads, streets, parks, pleasure or recreation grounds, or for the purpose of executing any work upon or under the land, incidental to a town planning scheme, whether in the nature of a building work or not." It adds: "The decision of the Minister as to whether land is likely to be used for building purposes shall be final."

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And the New York State law of 1913, which authorizes villages and cities to create planning commissions, provides that they may map not only areas within the villages or cities, but *"any land outside the limits of said city or village, so near, or so related thereto, that in the opinion of said planning commission it should be so mapped."* [1] This represents a considerable advance over even the legislation of 1909 by progressive Wisconsin, with its placing of the limit a mile and a half beyond city boundaries. But the principle was recognized as much as forty years ago in the Swedish Building Act of 1874.

Districting

The urgent need by city planners of permission to set up different restrictions in different parts of the same city is also gaining recognition. The general term for the method employed is "districting." The Constitution's guarantee of equality limits, of course, the city's police power to the extent that all legislative discriminations or classifications must be justified by differences of status, act, or occupation corresponding to the difference of legislative measures. This makes it necessary to determine what is a reasonable classification, and while it hampers considerably the freedom of districting which might be indulged in if there were not a constitution, it adds much to the interest and significance of the legislation enacted.

Passing over the widely accepted principle of two or more building districts, in one of which there is the requirement of fireproof construction—a form of districting of which the constitutionality has been uniformly upheld—we

[1] California's 1915 act requires city-planning commissions, if the city council so directs, to prepare adequate maps not only of the city, or of any part thereof, but of "adjacent territory lying outside the corporate boundaries."

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may note that Boston has divided itself into several districts as respects the height of buildings. A limit of one hundred and twenty-five feet is placed in one, and of eighty feet in another, with certain enumerated exceptions; while in yet other areas the height limit is made dependent on the width of street and building. The Supreme Court of the United States has upheld this action (*Welch* v. *Swasey*, 214 U. S. 91, 29 Sup. Ct. 567, 1909). Maryland has placed a special limit upon the height of the buildings within a block of the Washington Monument, in Baltimore; Indianapolis by ordinance has taken similar action in regard to structures on its Monument Place; and in the city of Washington the districting idea has been applied with great rigor for several years, as far as the heights of buildings are concerned. The last-named city is divided by streets into business and residential districts, a height of one hundred and thirty feet being the maximum allowed, under special conditions, in the former (except on a few blocks of Pennsylvania Avenue), and a height of eighty-five feet being the maximum in residence districts. St. Louis, by an amendment to its charter in 1901, gave to the St. Louis municipal assembly the right "to prohibit," by ordinance, "the erection or establishment or maintenance of any business houses, or the carrying on of any business vocation" on property fronting on a boulevard which might thereafter be opened.

Los Angeles, in 1909, established residence and industrial districts by an ordinance. From the residence districts certain kinds of business were excluded, even though they were already established there, and the Supreme Court of the state has approved the action. In 1912 the legislature of Maryland passed an act (Chapter 693) requiring that dwellings in a given section of Baltimore be detached, with no two closer than a designated number of feet. In 1912, also, Massachusetts amended its general municipal

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act (Chapter 334, Laws of 1912) so as to permit all cities and towns except Boston to regulate the height, area, location, and use of buildings within the whole or any defined part of their corporation limits. And the Province of Ontario extended the provision of its municipal act to permit cities having a population of 100,000 or more to control the location of apartment and tenement houses and of public garages.

In 1913 there was a wave of districting legislation. New York State (Chapter 774) authorized the common council in cities of the second class, on petition of two-thirds of the owners affected, to establish residence districts in which only single or two-family dwellings might be constructed. Six cities are in this class, and Utica and Syracuse have already acted. Minnesota passed an act (Chapter 420, Laws of 1913) empowering Duluth, Minneapolis, and St. Paul to establish residential and industrial districts, on petition of fifty per cent. of the property owners in the affected section. Any kind of business, and even tenements, apartment houses and hotels may be excluded from such a residence district. The act has been already utilized by Minneapolis. Wisconsin (Chapter 743, Laws of 1913) authorized its eight cities of 25,000 or more population to set aside "exclusive" residential districts. Seattle included the possibility of restricted districts in the building code adopted by it in July, 1913.

In 1914 the legislature of New York (Chapter 470) amended the charter of New York City in order to permit the board of estimate and apportionment to "divide the city into districts of such number, shape, and area as it may deem best suited" for a regulation of "the height and bulk of buildings and the area of yards, courts and other open spaces," and it gave to the board permission to make these regulations different in different districts. The board was given authority, also, to "regulate and restrict the location

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of trades and industries and the location of buildings designed for specific purposes," and to "divide the city into districts of such number, shape, and area as it may deem best suited to carry out" such purpose. This, the latest, seems to be the most definite districting legislation. It adds much to the power of the city planner to give effectiveness to his work.

Financial Measures

Coming to legislation designed to facilitate the financing of city-planning operations, the privilege of which most persons will think first is that of excess condemnation—i. e., the giving to a city of the right to condemn more land than that which it will actually and directly use in a given improvement. Until recently the right has been rarely granted in the United States; but it is common in Europe and South America, whence come familiar tales of great public improvements carried out by means of it at a minimum of net expenditure, and occasionally even at ultimate profit. This result has been accomplished by the exercise of "excess condemnation" for the acquirement of lands bordering on an improvement, and then by the resale of those lands at the enhanced value which the improvement bestows. Even where there is no question of recoupment or profit, the ownership of adjoining lands may mean much to a city in the control which it gives of their development, and in the acquisition at a minimum cost of possibly admirable sites for public buildings.

Though these arguments have proved convincing to foreign lawmakers and courts, there has been doubt in this country as to a speculative reduction of cost constituting a "public use" with such clearness as to carry the right of eminent domain. Much more evident was the injustice that occasionally might result from lack of such a privilege

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through the leaving of unusable remnants; the waste of public money that must result in settling damages for remnants—a waste that might be avoided, had the town the right to take the whole of a property instead of only the portion it would use; and the tendency of small left-over pieces to deteriorate in appearance to an extent that affects the whole improvement. So we find general powers of excess condemnation granted much more slowly in the United States than is a limited power that is applicable only to remnants.

Probably the earliest recognition of the principle, as applied to remnants, dates in the United States to two acts of 1867. One of these created the Fairmount Park Commission of Philadelphia. The other (Chapter 159, Mass. Acts of 1867) provided for the widening of Oliver Street in the city of Boston. For nearly forty years, strangely enough, this recognition seems not to have appeared again in American legislation, so far as the writer can learn. Then, in 1904, it was recognized in statutes of Ohio (Sec. 10, of Ohio Municipal Code, as amended), of Massachusetts (Chapter 443, Laws of 1904), and in the Maryland act which gave such advanced town-planning powers to the temporary Burnt District Commission of Baltimore, immediately after the fire. The latter act, for instance, stated that when, in the carrying out of the commission's purpose there proved to be need of taking only a portion of a lot, and the owner or owners thereof claimed compensation for the whole, the commission might (Sec. 9), "if they deem it best," accept "a surrender in writing of the whole lot, or the whole of said lot and improvements . . .; in which event the commission shall ascertain the full value thereof . . . and the whole amount of such valuation, when finally decided on, shall be paid or tendered the said owner or owners . . . ; and the said commission, after giving ten days' notice in two of the daily newspapers of the city of the

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time and place, manner and terms of sale, shall sell by public auction to the highest bidder the . . . residue of any lot of which a part shall be taken and used to effect the object confided to the commission."

One year after this, "An Act to repeal and re-enact with amendments the paragraph entitled, 'Condemnation of Property,' of Section 6, Article 4, of the Code of Public Local Laws of Maryland, title, City of Baltimore, sub-title, Charter" gave to that city the right to acquire excess land *"for the purpose of reselling such land, with reservations* in the deeds of such resale as to the future use of such lands, so as to protect," etc. Again, in 1908 (Chapter 166), the privilege was further extended, and it was permitted to include land for any public or municipal purpose, while in 1910 the mayor and council of Baltimore were authorized (Chapter 110) to delegate to the commission on city plan the powers connected with excess condemnation.

The Massachusetts authority was specifically limited to the acquisition of remnants which, from their size and shape, would be unavailable for the erection of suitable and appropriate buildings. The Ohio act gave the right to resell with restrictions designed to "protect public buildings and their environs, and to preserve the view, appearance, light, air, and usefulness of public grounds occupied by public buildings and esplanades and parkways leading thereto."

Virginia followed, in 1906, with an act (Chapter 194) permitting the acquisition of property adjoining streets as well as parks, "when the use of the land proposed to be taken would impair the beauty, usefulness or efficiency" of the public property; and in 1907 the Connecticut legislature, in creating the Hartford Commission on City Plan, gave to it the right of excess condemnation, with privilege to resell "with or without reservations" property not needed for an improvement—a privilege which the Connecticut legislature extended to other places in 1913.

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In 1911 the people of Massachusetts adopted an amendment to the state constitution, of which the purpose is to permit cities and towns to exercise the right of excess condemnation over more than remnants. The amendment required, however, that the excess lands thus taken should be "no more in extent than would be sufficient for suitable building lots on both sides of such highway or street." In 1912, Wisconsin and Ohio also incorporated the permission in constitutional amendments, and in 1913 the people of the state of New York amended their constitution for this purpose. The wording of the New York amendment closely follows that of Massachusetts, limiting the excess takings to an amount "sufficient to form suitable building sites"; but in reality this restriction amounts to little, as very seldom would there be desire to acquire more.

There has been considerable other legislation designed to facilitate the execution of city-planning projects by adding to the funds available. One method raises the limit of municipal indebtedness by exempting certain classes of bonds; another simplifies the technical details of condemnation procedure and broadens the use of the special assessment principle—notably in New York and Massachusetts. Thus a New York act (Chapter 679, Laws of 1911) authorizes the Board of Estimate and Apportionment in New York City, in the case of an improvement costing more than $15,000, to divide the expense between the city at large, if it so desires, the borough, and the special assessment district—instead of putting all the cost upon the latter—in instances where the improvement is of general benefit. The Massachusetts acts, which make special provisions for the assessment of betterments in Boston, are Chapter 393, Laws of 1906, and Chapter 536, Laws of 1913.

There has been also a great deal of legislation, mainly in city ordinances, which is designed to give control of street platting, by requiring the submission of plats to some official,

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board, or body; to facilitate the widening of streets, through the acquirement of easements or by the establishment of building lines, etc.; and finally to lessen the expense of extending streets, as by the publication of an ultimate intention. In Pennsylvania, for instance, a city may declare its purpose to extend a street at some future time, and for no structure erected after the notice, within the lines of the street extended, is it required to pay damages.

But to go with detail into all these matters would too greatly extend a chapter that is already long. Enough has been said to indicate the rapidity of the recent advance in city-planning legislation in this country and in Canada, and to show its interesting growth in scope and power in each of the four directions in which it mainly expresses itself.

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